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UNIVERSITY OF ALBERTA

SCREEN SHARE COMPUTER-MEDIATED COMMUNICATIONS IN DISTANCE EDUCATION

BY

KEWAL SINGH DHARIWAL

A THESIS SUBMITTED
TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF EDUCATION
IN
ADULT AND HIGHER EDUCATION

EDMONTON, ALBERTA
FALL, 1991

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UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Screen Share Computer-Mediated Communications in Distance Education" submitted by Kewal Singh Dhariwal in partial fulfillment of the requirements for the degree of Master of Education in Adult and Higher Education.

Dr. Milt Petruk (Supervisor)

Dr. Fred Ilott

Dr. Craig Montgomerie

Mr. J. Richardson

DEDICATION

To my parents Amrik and Sowaran, on your second attempt at retirement, may it be a long and happy one.

You brought me up with care and affection and showed me how to share love and warmth, to show tenderness and sympathy, to be strong and independent, to know that mistakes can be forgiven, to never give up if you are right, and most important of all to have fun in the process.

ABSTRACT

Screen Share Computer-mediated Communications (SSCMC) can be used today to functionally provide a learner at a remote location with access to a teacher at a different location. This means that a self directed learner doesn't have to rely on mail or other relatively slow means of communication for submission and return of assignments, or for solutions to learning problems. Nor does the learner have to face the limitations of communicating learning problems or receiving teacher solutions to learning problems only verbally as is the case in audio teleconferencing. The availability of a cost effective means of electronic communication which permits both voice and textual information to be used concurrently by learners and teachers, suggests that a self directed learner can learn successfully in the home, workplace or any other remote location equipped with ordinary telephone service.

This study investigated the general question: How effective is SSCMC as a means of supporting the delivery of instruction to self directed students at a remote location? Other questions which this study sought to answer were: How difficult did students find the SSCMC technology to operate and how readily did students initiate interaction using SSCMC? What are the tutor-learner relationships in a SSCMC environment? Would the SSCMC environment aid the tutor to help students overcome learning difficulties?

Ten students from a national telecommunications company took part in this study. The students were volunteers from seven different departments located in the company's Calgary headquarters. Students participated in two days of training as established in their workplace. The training was delivered using a set of customized self directed learning materials, in a specially configured training room. The self directed learning materials consisted of a videotape, an exercise and test workbook,

a study guide and a course outline. The tutor was located 280 Kilometers away in Edmonton.

Results indicated that 80 percent of the students completed their learning program well within the two day time frame allowed for the training, with an average post-test score of 88.75%. The completion rate is consistent with findings from earlier studies of Ostman and Wagner (cited in Cookson, 1989) on persistence, given enhanced learner motivation as a result of fast turnaround times for submitted assignments. The other 20 percent of students withdrew from the program, as a result of work related pressures. The high post-test average score may have resulted from the students' background in the Lotus 1-2-3™ software package which is similar to the MSExcel™ software package used to provide the subject matter in this study. Sixty seven percent of the students had used Lotus 1-2-3™ before.

Students learned to use SSCMC with little or no difficulty. All of the SSCMC students trained in the use of SSCMC, initiated contact with the tutor to overcome learning problems at least four times. Seventy percent of the learning difficulties encountered by the students required real-time screen share interaction via SSCMC to enable the tutor to suggest workable solutions. The tutor and all the students who successfully completed the SSCMC training program judged problem solving by SSCMC as offering as satisfactory a solution to their learning problems as that available in the face to face classroom interaction.

The results suggest that SSCMC could provide an effective solution to many distance education problems.

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My thesis committee for pushing me to provide the facts and recommendations in a way that would allow others to be aware of some of the ramifications of such a study.

My ten students and five supporters, individuals who were prepared to take a chance and try something new and challenging.

Jim, Bud, Gary, Henry, Mohammed, David, Lloyd, Cameron, Harold and a host of others who provided ideas, input, incentive and support when I most needed it.

Gurpreet, Rikveer & Symone -- the source of my motivation, support and future expectations.

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Chapter 1

IDENTIFICATION OF THE PROBLEM

Education has grown out of a paradigm in which the fundamental elements of teaching and learning, the teacher and the students would be present together, at the same place at the same time. The process of learning consisted of listening to the teacher, and the teacher was responsible for making learning happen. A contemporary redefinition of learning involved encouraging students to accept responsibility for their learning activities. Thus arose the concept of the independent student. But the independent student needs to be supported by a teacher somewhere.

Initially the independent student was supported by a teacher through the use of print material and the postal mail service, later by audioconference and teleconference calls, followed by the facsimile machine and most recently this support involves the use of microcomputers.

Today technology has advanced to the point where it is possible for two people physically located at different places and connected by telephones and modems to see identical information on their computer screens. This connection allows for either person to interact with the screen display, while the other person views that interaction in real time. Either person can communicate with the other, including asking questions by typing text on either screen and having the same text appear on the other screen instantly. This process is referred to in this research as screen share computer-mediated communications (SSCMC).

While little or no research has been done to explore the potential of SSCMC for instruction, it seems logical that it may be helpful in addressing problems that are encountered when providing instructional support to independent students, particularly if they are located physically at locations different from the instructional support people.

Therefore in this study a sample of students were given access to a learning room which contained self paced training materials comprising a videotape, workbook, a videotape player and a microcomputer with all the software necessary to learn Microsoft Excel™ as independent students. The students were scheduled independently and sequentially to access these learning materials and resources. Initial startup assistance was provided to each student by a local student-site assistant. A technical and subject matter help desk was provided by a distant tutor. Access to the tutor was provided via SSCMC for the purposes of helping students overcome learning difficulties. The teacher was physically located several hundred kilometers away.

Introduction to Screen Share Computer-Mediated Communications

The Emergence of Screen Share Computer - Mediated Communications in Distance Education

In 1990 Keegan wrote :

> In the 1980's distance education emerged as a standard component of the provision of education in many national systems. In contrast with conventional education which is oral and group based, distance education shatters the interpersonal communication of face-to-face provision and disperses the learning group throughout the nation. (p.3).

He goes on further to state that in post-industrialized society there has been a growth of personal privacy and a loss of the sense of community. This has been coupled with the "incapacity of on-campus programmes to cope with even minimal educational opportunity elsewhere." This suggests that educational institutes involved in distance education should address the changing learning needs of their clients.

In post-industrialized society new technology has added some unique dimensions to distance education. Consequently distance education may now be better able to address the needs of the dispersed learning group.

Computer-mediated Communication: What Is It?

Screen Share Computer-mediated communication (SSCMC) is a relatively new phenomenon in distance education. The concept of SSCMC is still evolving and therefore it is often described in many different ways. Many authors refer to it as a communication between individuals through the use of typed computer exchanges (that is, electronic mail) and among individuals (electronic conferencing) (Ahola-Sidaway, Maclean & Truehaft, 1990; Naidu, 1988).

Naidu (1988) refers to computer conferencing(CC) as one form of computer-mediated (CMC), where there is

> "communication between or amongst individuals separated by time and space via telephone lines, personal computers and modems through a host mainframe computer. The latter, in housing the conferencing software and storage facilities for conference proceedings, performs a useful mediating role in the activity. Computer conferencing enables a group of users to carry on a conversation on any issue of common concern while separated by time and space from one another." (p. 2)

Florini (1989), refers to CMC with the following description:

> "Computer conferencing is a computer-mediated form of telecommunications; that is, a computer plays an intermediary role in the process of your exchanging communications with those whom you cannot conveniently meet face-to-face. Conference participants need access to either of the following arrangements: (a) access to a microcomputer, a modem, telecommunications software, and a telephone outlet in order to communicate with a mainframe computer housing the conferencing software or, (b) access to a computer terminal connected to the mainframe. Computer conferencing is similar to e-mail, its electronic relative, in that messages sent to you can arrive virtually instantaneously but are stored by the computer until it is convenient for you to receive them. Similarly, you can send messages to others to read at their convenience. In other words, communication exchanges take place asynchronously (not at the same time). Neither sender nor receiver is bound by the time and place constraint imposed by the more synchronous telephone."(p.8)

The preceding descriptions of CMC have one thing in common: the use of the host or mainframe computer on which the conferencing software resides and the use of electronic mail as the primary vehicle of communication.

The host or mainframe computer may have been necessary in the past. Today, however, microcomputers have become ubiquitous, extremely powerful and easier to use. People are also becoming more accustomed to using computer-mediated telecommunications (Florini, 1989). The telecommunications industry too, has become more reliable, there are fewer transmission and reception errors during the communication. Telecommunications equipment has greater capacity and more features today. These factors coupled with advances in computer conferencing software have resulted in eliminating the need for a mainframe for many types of CMC.

While many descriptions of standard CMC exist, the one used in this study is an attempt to describe SSCMC. The following is a description of SSCMC as it applies to this study. Screen Share Computer-mediated Communication (SSCMC) describes a situation where it is possible for two computers physically located at different places to display identical information on their screens, and for either operator to interact with one screen display, with the other operator viewing that interaction in real time on the other screen display. Either operator can communicate with the other, including asking questions by typing text on either screen or manipulating graphics on the screen and having the same text or graphics appear on the other screen instantly. SSCMC participants (that is, the tutor and students) require or need access to the following arrangement: a microcomputer, a modem, a telephone, and SSCMC software (Appendix C). The communication may be about the student's learning problem or about the tutor's solution to a problem, and it should allow either individual to change the screen(s).

While there are several different SSCMC software packages available on the market (five were evaluated by this researcher), Cosession™ was chosen because it offered the greatest number of features, particularly "Voice First". "Voice First" is a feature of Cosession™ which offers the option of beginning a remote session with an ordinary phone call and voice conversation which can be instantly toggled to a

microcomputer-modem linkage mode, without redialing. Other features of Cosession™ are listed in detail in Appendix A. The other five SSCMC packages evaluated towards inclusion in this study were : 1. Mirror II™, 2. PC Anywhere™, 3. Carbon Copy™, 4. Close-up™, 5. Timbuktu Remote™. Ease of use, set up and speed of operation were considered for each SSCMC package. Cosession™ performed better than the four MSDOS based SSCMC packages tested. The fifth SSCMC package: Timbuktu, was a SSCMC package for the Apple MacIntosh™ microcomputer and as such does not run on an MSDOS microcomputer. It too lacked the Voice First feature.

Definition of Terms

The definition of terms is extensive for this research area and as a result, a significant set of definitions is provided in Appendix B.

The Research Area

Distance education is an international phenomenon and has become increasingly widespread (Keegan, 1990). This growth is a result of improvements in the methods and technology of distance education, during the 1970's and 1980s, which were both qualitative and quantitative. Examples often cited are the development of new telecommunications technology (Bates, 1984; Hiltz, 1986; Ruggles et al., 1982), a growth in investment, increased use of printed materials and improved designs for instructional materials (Daniel and Stroud, 1981; Holmberg, 1981; Moore, 1988), greater provision of support services for students studying at a distance (Harry, 1986; Sewart cited in Keegan, 1990) and the development of institutions in developed and developing countries such as the British Open University (Harry, 1982; Rumble and Keegan, 1982), the German FernUniversitat (Bartels and Peters, 1984), and the Indira Gandhi National Open University (Datt, 1988; Gupta, 1989).

In Canada large institutions and departments within institutions have responded to the needs of adults for individualized and decentralized educational opportunities. These institutions offer distance education courses and programs to meet some of the demands of these students. These demands continue to change over time. One of the changes is that distance education today is characterized by self-directed learning in private situations (Smith, 1987). Self-directed learning in distance education separates the student from the learning group and places that student in a more private situation.

One element of distance education that may further enhance the ability of tutors to effectively support the student in this private situation, is the development of screen share computer-mediated communications (SSCMC).

What are the relative merits of SSCMC as a teaching or learning tool? What is its potential for distance education? While there is some evidence of different types of CMC usage in distance education, there is no evidence of the type of SSCMC used in this study. This thesis describes some key issues associated with an experimental implementation of this SSCMC in an industrial training setting. In this setting, the student used a self-paced videotape for delivery of the subject matter, a workbook for reinforcement of learned concepts with self-administered testing, and two way communications between the students and the remote tutor.

Context of the problem

The term distance education has changed considerably in the last 25 years. From earlier definitions of distance education (Dohmen, 1967; Garrison and Shale, 1987; Gough, 1981; Holmberg, 1977; Keegan, 1980, 1983; Moore, 1973; Peters, 1968, 1973; Smith, 1987; Sparkes, 1987) (cited in Keegan, 1990), Keegan (1990) has formulated the following five elements:

Distance education is a form of education characterized by:

•the quasi-permanent separation of teacher and learner

throughout the length of the learning process (this distinguishes it from conventional face to face education);
- the influence of an educational organization both in the planning and preparation of learning materials and in the provision of student support services (this distinguishes it from private study and teach yourself programmes);
- the use of technical media - print, audio, video or computer, to unite the teacher and learner and carry the content of the course;
- the provision of two way communication so that the student may benefit from or even initiate dialogue (this distinguishes it from other uses of technology in education); and
- the quasi-permanent absence of the learning group throughout the length of the learning process so that people are usually taught as individuals and not in groups, with the possibility of occasional meetings for both didactic and socialization purposes. (p. 44)

At this stage of development in distance education, it can be argued that what is needed is a solid base of case studies that report descriptive data when using some or all of the five elements described by Keegan. There are many elements in this experimental implementation of SSCMC which conform to the five listed by Keegan.

The purpose of this study was to document student experiences and opinions formulated as a result of taking part in a distance education course in which there was:

a) a physical separation of tutor and student throughout the length of the learning process;

b) the influence of an educational organization both in the planning and preparation of learning materials and in the provision of student support services;

c) the use of technical media - print, audio, video and computer, to link the tutor and student and to deliver the content of the course;

d) the provision of two way communication between student and tutor, so that the student could benefit from or even initiate dialogue; and

e) the absence of a formal learning group throughout the length of the learning process.

The general question to be answered was: What was the degree of success of the learning given a situation where students were learning privately in the workplace, during company time, at their own pace, and with access to a distant tutor? A number of more specific questions served as guides to the research.

Research Questions

The specific questions which guided this study follow:

1. Does tutorial assistance supported by SSCMC contribute to learning as measured by : a) achievement;
   b) proportion of students completing the program; and
   c) time taken to complete?
2. To what extent did SSCMC contribute to the communication of learning problems and the subsequent resolution of these problems back to the student?
3. What were the student attitudes toward tutorial assistance supported by SSCMC?
4. Is the content of SSCMC too complex for students to learn?
5. Can SSCMC be used as a method of delivering SSCMC training?
6. Given access to SSCMC would students, when they needed help, initiate the interaction with the tutor ?
7. What are the tutor - student relationships in a SSCMC environment?

Significance of the Study

This study is important in that the uses of SSCMC are boundless. For example, in undergraduate and graduate level courses, distance will no longer be as important a factor in the quality of access to a tutor. Students can just as easily study an English language course as any microcomputer software course, at a distance, provided they have access to a tutor via SSCMC. Assignments consisting of either a specific software file or a text file can be transmitted to the instructor electronically.

In business and industry, the demands placed on staff development officers for employee updating may be better addressed through the use of SSCMC and distant tutors, especially if employees and tutors are not required to leave the comfort of their office or home to access each other for purposes of learning. In large corporations employees are geographically dispersed and product experts or expert tutors are few in number. Staff development officers often do not have the time to tour all the distant offices of their corporation in order to update employees on new developments. There is a need for technology to bring these staff development officers and the corporation's employees together. SSCMC makes it possible for the skills and knowledge of these experts to be put to greater corporate use.

There are many areas of SSCMC which require research, one of which is the student - tutor communication process and its effectiveness in a SSCMC enironment. Student motivation is also of great concern in distance education. SSCMC may enhance students' motivation to complete their programs of study.

Distance education is a very important part of contemporary society and any research that can contribute to its improvement is highly desirable. SSCMC between the student and the tutor may become an essential part of successful distance education programs. This study examines the feasibility of using recent technology to facilitate a real time interaction over the same learning assignment, regardless of whether the assignment was an engineering drawing or an English essay, between two people in distant locations to overcome learning problems. It is really important to know whether this technology brings about improvements in the support of self-directed learners.

Student - tutor communication effectiveness.

SSCMC enhances the tutor's effectiveness in helping to solve the student's learning difficulties. There are improved opportunities to communicate problems accurately via images rather than verbal communication. Consequently, the tutor's and

student's understanding of the problem or solution should improve. Students that do not type very well may be able to use the microcomputer mouse (the movement of a pointer on a microcomputer screen through a hand held table top device, connected to the microcomputer) to gesture on the screen in order to communicate their problem faster and more accurately.

SSCMC allows tutors to structure the learning experience more effectively and provide for interactive simulations with their contributions during the SSCMC session. For example, SSCMC provides opportunities for a show and tell, thereby simulating one aspect of the classroom situation at a distance, assuming that this aspect of the classroom model is of pedagogical value in distance education.

Student Motivation

SSCMC enhances the tutor's ability to maintain motivation of the student by providing timely assistance and immediate or delayed feedback as is necessary. SSCMC allows students to submit assignments electronically for marking and receive the results before starting more advanced work. The fact that tutorial assistance is available provides a "safety net" for the insecure students. The availability of this "safety net" may allow students to extend themselves in their efforts to learn.

Present and Future Tutors.

This study has significance for present and future tutors and students by providing information about the ease of use of SSCMC and the change(s) in relationship, motivation and completion rates that it fosters. This study also highlights the type and form of institutional intervention required for successful completion of distance education programs.

Assumptions

There were two major assumptions underlying this study. The first is that students who took the training spent the time allocated for training using the learning materials provided. It is possible that students arrived in the learning room on time, signed in with the tutor, and then started to work on job related activities rather than the scheduled learning activities. However, this is unlikely because the students in this study were volunteers who were aware of the research nature of this study.

The second is that the students did not receive assistance from anyone but the tutor to overcome learning difficulties. It is possible that the students accessed local experts to overcome learning problems and that they received alternative tutoring from students who had already completed the training. However, students were volunteers who were aware that this was a research study and it is unlikely that they would have chosen to access support other than that provided by the tutor. If the tutor had been unable to answer all of the questions asked by a student, it is possible in that instance that students would seek a local expert. However, as the company was just beginning to standardize on Microsoft Excel™ at the time of this study, it is unlikely that easily accessible local experts existed. Students were not grouped and it is also unlikely that they learnt from each other.

Limitations of the Study

There are three limitations of this study. Firstly, the sample size of this study group (ten students) is very small. As a result, very small changes tend to show up as large percentage changes in the data. This limits the generalizability of the findings in this study. Secondly, since the students that took the training were volunteers who knew about the research aspects of the project, they may have volunteered because of personal interests, experience or strong opinions in the research area. As a result, they were not a random cross-section of the population and consequently may have had a

strong motivation to succeed. Thirdly, the SSCMC methodology loaned itself particularly well to this study especially when teaching a computer related subject.

Delimitations of the Study

One of the delimiting factors in this study was the fact that all students who wanted to volunteer for this training had to have a sound background in the use and control of MSDOS™ microcomputers. The most important aspect of this study was not how well the tutor or students did on the training but rather what was learned about SSCMC as a troubleshooting and/or communications and/or motivation tool. This study was exploratory, descriptive and documentary in nature. The experiences (likes, dislikes, beliefs, successes, failures and dialogue) of students and the tutor in a SSCMC environment were the main tenets under observation. This study:

1. examined the effect of separation of the student and the teacher during the learning process.
2. documented the use of technical media to interconnect the student and the teacher.
3. documented the effect of two way communication, specifically real time interaction, on the dialogue between student and tutor.

This study did not attempt to measure the effectiveness of the learning materials in addressing adult learning issues. Nor did this study attempt to measure the effect of the absence of the formal learning group on students' learning.

Chapter 2

REVIEW OF RELATED LITERATURE

In chapter one, Keegan's five elements of distance education were described. It was further stated that this study would document student experiences and opinions formulated as a result of taking part in a distance education course in which Keegan's five elements were implemented. The following is an analysis of the related research and how it affected the preparation of materials and pedagogical procedures for this study. The five elements considered in detail were:

a) The issues surrounding the physical separation of the teacher from the student during the learning process;

b) The issues surrounding the preparation of learning materials by educational institutions;

c) The issues surrounding preparation and use of technical media to link the tutor and student;

d) The issues surrounding two way communication of dialogue between tutor and student; and

e) The issues surrounding the absence of the learning group from the support mechanism of the student.

SSCMC as used in this study and any related research is addressed under element c), the issues surrounding use of technical media, and element d), the issues surrounding two way communication of dialogue.

Issues Surrounding the Physical Separation of the Teacher From The Learner During the Learning Process

Virtually every attempt at defining distance education refers to the physical separation of teacher and student (Garrison, 1989; Keegan, 1990). Theories of

autonomy of the student and independent study derive mainly from the 1960s and 1970s. Moore (1972, 1973) identifies the origin of distance education as the concept of separation of student and teacher. Wedemeyer (1981) updated his 1978 work and listed ten characteristics of a system of study that separated teaching from learning:

> 1. The system should be capable of operation any place where there are students - or even only one student - whether or not here are teachers at the same place at the same time.
> 2. The system should place greater responsibility for the learning in the student.
> 3. The system should free faculty members from custodial type duties so that more time can be given to truly educational tasks.
> 4. The system should offer students and adults wider choices (more opportunities) in courses, formats, methodologies.
> 5. The system should use, as appropriate, all teaching media and methods that have been proved effective.
> 6. The system should mix and combine media and methods so that each subject or unit within a subject is taught in the best way known.
> 7. The system should cause the redesign and development of courses to fit into an 'articulated media programme'.
> 8. The system should preserve and enhance opportunities for adaptation to individual differences.
> 9. The system should evaluate student achievement simply, not by raising barriers concerned with the place the student studies, the rate at which he studies, the method by which he studies or the sequence within which he studies.
> 10. The system should permit students to start, stop and learn at their own pace. (p. 36).

Wedemeyer developed the concept of distance further by integrating social and cultural distance with physical distance. He added these concepts to such earlier concepts as freedom to self-pace, and to individualize and customize the students' learning according to the needs of the student (who selects his/her own goals and objectives).

In recent years, some of the earlier distance education theories have been challenged. Willen (1988) states that distance education is chosen mainly for practical reasons, and that there is little or no empirical evidence to justify Moore's and Wedemeyer's position that the student is a person willing and able to work through an educational programme on his own and chooses this kind of learning because they have these special personal qualities. Willen's research challenges the notions of

independence and autonomy put forward by Moore. Keegan (1990) states that "despite some recent contributions (Moore 1988), Moore does not seem to recognize the seriousness of Willen's challenge."

Bates (1988a) also supports Willen's practical reasons theory for the justification of the setting up and usage of distance education. Bates states that "the planners of distance education systems have to live in the real world, where finance, politics and the power of existing organizations all influence decision making".

Whether distance education is chosen by the student for practical reasons or because of learning preference, some elements of institute or corporate control are desirable. For example, Daniel & Shale (1979) suggest that the more freedom a student has the less likely he is to complete the course. They are of the opinion that distance systems can either give the students the dignity of succeeding by pacing them or the freedom to fail without pacing. This is consistent with Willen's position on practicality, student dependence on the teaching institution and desires for guided and paced learning.

Within this study, the selected videotape, the developed workbook of tests and exercises, and the student-chosen sequencing allowed the student freedom to self-pace and to individualize his learning. This is consistent with Wedemeyer's and Moore's suggestions for a system of study in which the learner and the tutor are separated by distance. The type of exercises in the workbook were developed in response to the needs of the company's employees. These needs were communicated to the developer by representatives of the company. These needs were not validated. Opportunities to further self-customize the training were available to the students in the form of exercises they could choose to complete or not complete prior to each evaluation test. Each exercise or evaluation test could be completed in a sequence determined by each student. This is again consistent with Wedemeyer's and Moore's suggestions.

In response to the company's requirements, students were given two full days to complete their studies. The company specified the time, place and the length of the learning day. This is consistent with Bates suggestions of real world situations which dictate the planning of distance education systems. Students were contacted at preset times to verify progress. This prearranged contact was designed into the program in order to conform to Daniel & Shale's (1979) findings to control pacing. This aspect of pacing and preset contact time is also consistent with Willen's views on student dependence on the teaching institute to provide for student motivation.

Student responsibility for learning, independence and autonomy as highlighted by Moore & Wedemeyer were facilitated within the program in the following manner. Time allowances were made during the two days of learning for students to attend meetings or other urgent work related activities as they arose, and this fact was communicated by the tutor to each student at the outset of their training. The students could start, stop or restart their training program when and where they wanted, that is, they had the freedom to proceed at their own pace, within an overall employer determined guideline. In exceptional cases it was possible for students to schedule the start of their training in one week but complete it in another.

The training facility was located at the students' place-of-employment. The location of the training facility as well as the learning methods used were also consistent with Willen's and Bate's views on ease of access and practicality of learning materials and methods. The preparation of learning materials is covered in the following section.

Issues Surrounding Preparation of Learning Materials by Education Institutions.

Gupta (1989) described two models for designing instruction for distance students. Firstly, the traditional model, on which most correspondence schools are based, is editorial in nature. Initially study materials are prepared by subject matter specialists, then instruction is prepared by teachers. Additional teaching or learning

resources are generated by the teacher, to supplement, enrich and guide the student through the study materials. The use of alternative media in this approach is to provide "diversion, relaxation, and independent, supplementary or complementary materials" (Gupta, 1989).

Secondly, the 'generator' model (Gupta, 1989). This approach takes a very different development process. There is systematic 'finegraining' and 'preplanning' to produce effective and interesting experiences for the students. Selection of media, and placing of media is relational, developmental, and based on the strengths of its alternative to print, not duplicating nor reinforcing materials contained in print. The selection, presentation, and organization of media is done without input from the subject specialist.

Many authors suggest similar yet different frameworks for the 'generator' model of instructional design (Bååth, (1982); Collett, Kerr & Watters, (1988); Jenkins, (1985); Kaul, (1986); Lewis, (1985); Reigeluth, Merril & Bunderson, (1978); Reigeluth, (1973); Taylor, (1986) cited in Gupta, 1989). These authors cover such important issues as : "critical learning attributes of students, specification of clearly defined learning outcomes; the selection of appropriate learning experiences in a planned sequence; the design of appropriate assessment techniques and instruments based on the principles of self-instruction; the design of relevant diagnostic, remedial and feedback systems; and the design and development of learner support systems/services" (Gupta, 1989). Gupta also identified many pitfalls to the approach of the 'generator' model :

1. lack of methods for effective student involvement in course development;
2. limited communication between designers and developers;
3. limited research evidence on the use of multimedia systems;
4. insufficient data about prospective students and their needs;
5. scheduling limited resources throws out student autonomy;

6. insufficient knowledge about the communication gap between the student, the teacher and the course designers;
7. insufficient data or inaccurate conclusions about how much time the distant student has to use the detailed multimedia packages of learning materials;
8. insufficient data about what makes a successful distance education course;
9. the full cost-effectiveness and other potentials of multimedia in an ideal mix are still far from being realized;
10. very little research exists on enhancement of learning, success rates, or on the effects of enrollment changes, and workload changes for teachers and students; and,
11. there is very little empirical research about the cost and time required to put together effective distance education programmes.

The preparation of materials using the traditional model is perhaps less expensive, more practical and can be done in less time. Today, however, there are greater opportunities to use the 'generator' model because provincial and federal governments have become more willing to reallocate resources to the development of materials to extend educational institutes' programming to distant students (Seabourne & Zuckernick, 1986).

For this study, the development of instruction for distance students has followed the traditional model outlined above. Subject matter specialists, using a variety of television, graphics and audio techniques, created the videotape, an instructor developed the instructional guidelines, workbook and course outline. These materials were validated by a consultant who delivers training to students in the subject matter.

The researcher-tutor prepared the course outline, instructional guidelines and the student workbook bearing in mind seven adult education characteristics as proposed by Romiszowski (1986):

1. Adults do not learn a given topic satisfactorily if they do not really believe it has any relevance to their real life situation, or that it is true at all. To counter this in this study, the exercises in the workbook resembled as closely as possible the company's standard documents.
2. Adults prefer small segments or single concepts in single theory courses. Adults also prefer that the focus of the lesson be on applications of the concept to current practical problems. In this study these preferences were catered to by making each exercise in the workbook concise and designing it so that it required only a few minutes to complete. The exercises chosen for student practice on each segment of the lesson were applications to current practical problems faced by the company's employees on a day to day basis.
3. Adults prefer self-directed instruction. To facilitate this aspect of learning in this study, there were three exercises and one test available in the workbook, to be completed by each student for each segment of learning delivered by the videotape. Students could decide to do none, one or all of the exercises before attempting the test. Additionally the videotape introduction showed students how to view the videotape so as to allow for later direct accessing of different sections of the videotape. These two factors allowed students the opportunity to follow a completely self-directed, self-sequenced and personalized delivery.
4. Adults prefer to select several media for delivery of instruction. In this study the available mix of human, computer, video and text presentation through the use of a videotape, workbook, microcomputer and distant tutor facilitated student preferences for multimedia. This mix facilitated repetiton of lesson delivery or alternate media for clarification or show and tell sessions.

5. Bruner and Papert state that adults learn by doing (cited in Romiszowski, 1986).

The student workbook was designed to ensure that the student physically interacted with the videotape, the microcomputer, the SSCMC software and the tutor. Teaching the use of SSCMC by using SSCMC (learn by doing) was chosen over other methods such as videoconferencing or classroom teaching. Both videoconferencing and classroom teaching were extensively discussed for use in this study, but were dismissed because probable users of this type of SSCMC wouldn't have or be able to afford videoconferencing or classroom delivery of SSCMC training at the front end of such a course of study.

6. Different adults have different needs at different times.

To address the different needs of students in this study, the tutor was available to help students with their changing needs and to give advice as sought. The time allocated for completion of the training made allowances for the changing needs of the workplace, the student's home circumstances or illness. Students were informed, at the start of this study, that changes in the scheduling of their training could be made, if required.

7. Adults are concerned with efficiency, effectiveness and time savings.

To address this concern in this study the effectiveness of the exercise design (practical work related exercises), and the travel time savings (to a local place of study) were all communicated by the tutor to the students as being designed features of the training. Students were informed at the beginning of this study, by the tutor, that it was possible for them to complete the training in one day, if they already had some experience with the subject matter, and diligently worked on their learning tasks.

Naidu (1988) states that one weakness of distance education is the inability of the institution to cater to the individual's learning needs through a common materials

package. In this study, the materials package was designed to overcome this weakness. During the initial telephone based tutor-student discussion the tutor communicated to the student that the institute had the capability to cater to the individual student's needs. This was done by showing the student how the workbook had been designed to facilitate a customized approach to learning based on the student's needs.

The learning materials were developed for this study with the assistance of an educational institute. The researcher was able to access the services of an instructional designer at a local educational institute to validate the workbook's instructional design. The materials were developed using standards formulated by the researcher in delivering self-paced instruction to students in non SSCMC mode in the workplace over a period of six years. Consequently, these activities added to the value and consistency of the materials. The students taking part in the study were made aware of these facts by the tutor at the outset of the training program. In addition, the use of the workbook, videotape and a recorded playback of a SSCMC session with the tutor, were designed to provide the necessary components in accommodating "flexible, self-willed learning styles" of adult students (Naidu, 1988). These learning materials, the videotape and SSCMC, are described in more detail under the next section.

Issues Surrounding Preparation and Use of Technical Media to Link the Tutor and Learner.

Garrison (1987) suggests that the role of technology in distance education should be researched to determine how it will assist in meeting the needs of the students in terms of equity of access, learning support, and the teacher-student interaction during the learning process. Bates (1988b) suggests investigating the appropriate teaching roles for different technologies. "The existence of distance education as it stands today, is largely dependent on the use of new technologies, therefore it is important that the

technologies be understood so that their potential can be optimized" (Garrison, 1987).

Florini (1989) states that:

> Various forms of advanced communications technology provide educators with opportunities to reach new audiences and to reach old audiences in new ways. Of the newer technologies, computer conferencing is especially promising for use in adult education. This technology combines the convenience of mail with something approximating the communicative interaction of the telephone. The result is an enhanced form of communication. Like mail and the telephone, computer conferencing can reach learners in their homes, at their work sites, or during their travels. Consequently, people who are homebound, geographically isolated, or constrained by time-related factors can participate in educational opportunities in ways previously impossible (p. 8).

The use of technology however, does not always improve a program or a course of study. Frequently, programs are adapted to make use of some new technology or educators are given a new technology based system with minimal consideration of the type of program or the value of the technology to the program (Burnham & Seamons, 1987; Garrison, 1987).

The strength of technology lies in its appropriate usage towards achieving specific learning objectives, and not merely in its use because of its newness. The appropriate usage of technology is a question that program developers and instructional designers must decide. Very little theory exists to guide the instructional developer on the best technology to use for the delivery or to guide content design (Bates, 1988a; Burnham & Seamons, 1987; Garrison, 1987). In this research, many technologies were used: a videotape and workbook to deliver the training, a microcomputer and SSCMC software package to access the tutor, and the subject matter itself was a popular software package. The value of using these popular technologies lies in their mass access, both at work and at home.

Technology may be able to give more autonomy to the student. Garrison (1989) suggests "Communications technology is breaking down the existing bureaucratic structure where the teacher is the primary source of information and

control" (p.41). Heinich (1984) suggests "the development of instructional technology has disturbed the symbiotic relationship between instructional materials and teachers" (p.69). This implies that students, as a result of technology, can be given a number of individualized learning options, and allowed to choose the the methods they perceive to be most favorable to their learning situation. Learners were also free to choose their learning strategies. Moving the control of learning strategies to the students is consistent with Moore's (1972, 1983) position on autonomy for the student as a fundamental of distance education. Many education theories, including those expounded by Moore, suggest that the adult student is capable of making informed educational decisions.

Ingle (1984) sees alternative systems for the delivery of education, which are more personal, home and work based. There is a need to establish appropriate strategies for delivering education in these evolving situations. This research documents one strategy in work based training, and the role of technology in this form of distance education, describing how a tutor supports a student at a distance using screen share interactivity via SSCMC and the form taken by a tutor-to-student or student-to-tutor interaction.

Sparkes (1984) suggests that the role of technology varies in different learning situations. He views technology very much from a pedagogical perspective based on a modified version of Bloom's (1956) taxonomy of educational objectives: cognitive, affective and psychomotor. Sparkes sees varied applications of different technical media depending upon what is taught. For Sparkes the role of technology is constantly changing, dependent on changes in the learning environment, which changes as the student's needs change. In rapidly changing environments, it is even more important to ensure relevance of both methods and technologies chosen for specific roles. Sparkes states that where "applications in the educational environment are ever expanding, educators should ensure that the technologies used are doing what is expected."

In order to determine whether technical media are being used appropriately to facilitate learning, one approach would be to look at the learning processes and the instructional methods in educational theory together. It would then be possible to evaluate changes in the amount of learner independence based on the introduction of different technologies for different segments of the learning process and whether this results in improved learning. This is an area where very little definitive research exists.

If one used Gagne's (1988) sequence of instructional events : "1. gaining attention; 2. informing the student of the objective; 3. stimulating recall of prerequisite learning; 4. presenting the stimulus material; 5. providing learning guidance; 6. eliciting the performance; 7. providing feedback about performance correctness; 8. assessing the performance; 9. enhancing retention and transfer." (p.182), it would be possible to use different technical media at each stage, the challenge would be to use the most appropriate media and to measure if improvements in learning occurred as a result. Higher achievement and faster completion could be used as two possible measures for evaluation purposes.

Bates (1988a) partly contradicts the above process. He feels that although textbooks on media selection exist (Reiser & Gagne, 1983; Romiszowski, 1974) they are "useless for distance education's needs, because they are designed for the small traditional classroom where pedagogy is the only constraint". He thinks that because all distance education systems are unique, there is no one optimum media choice possible. Each teaching system is designed within its own operational circumstances and is different from other teaching systems. Consequently, "there is no logical step-by-step procedure for deciding on the 'best' media configuration or collaborative arrangements." (p. 337).

According to Bates, access, delivery, and quality of access are the most important factors in distance education. The media used may be instructionally effective, but is of no use if it can't get to the target audience. If the media is to be

used, then time and place of availability are extremely important. There is no point in providing expensive media centres if they are unreliable or no one knows how to maintain them properly.

Consequently, even with today's advances in electronic technology, print media and correspondence education continue to be the dominant distance education strategies in North America (Holmberg, 1989; Moore, 1987). The learning materials used in this study are in a form that may be useable for correspondence education. Therefore, this format may have improved the opportunities for the materials to be used by the students.

In this study, the aim was to make the course available to the target audience in a timely and convenient manner, which is consistent with Bates (1988a) view above. This ensured that the technical media would get the best opportunities to be chosen as a delivery vehicle for the subject matter. Florini (1989) states that observation and experience in using advanced technology with students suggests that their energies initially will be focused almost exclusively on the procedures for using the technology. Instructors then need to take steps to ease students' first use of a technology like computer conferencing. The present research followed these and other similar suggestions (Harasim, 1987; Hiltz, 1988b; Mason, 1988), by training a student-site assistant who was available to the students to help them on the first use of the SSCMC technology.

Daily testing of the research equipment was scheduled to ensure that the media centre used in this study was operational throughout this study and that any problems were quickly identified. Training was given by the tutor to the two student-site assistants, on how to set up and maintain the equipment. This was to ensure that the technology didn't interfere with any learning that may have occurred. This arrangement satisfied Bates suggestions on the provision and maintenance of technical media centres.

Scheduled contact times with the students ensured that timely information was gathered on whether the technology was doing what was expected. This arrangement was consistent with Sparkes view on technology expectations.

Issues Surrounding Two-way Communications Dialogue Between the Tutor and the Learner.

Law & Sissons (1985) state that "the challenge of distance education is to open a genuine dialogue that builds the student's autonomy" (p.43). Dialogue is required to make the learning experience effective and "dialogue requires two real people" (p.51). It is important for us to determine what this dialogue represents.

Robinson (1982) stated that all distance education students at some time experience common problems associated with this mode of learning. These problems he categorized as follows:

> •those relating to study techniques and learning difficulties.
> •those arising from an individual trying to interact with a distant and sometimes impersonal institution.
> •those which are personal and affect the student's work. (p.14).

Dialogue can be tutor or student initiated. In this study, dialogue between the student and tutor was a designed requirement. The tutor and the student had scheduled interaction 4 times daily, once at the start and end of the day, and once at the start and end of the lunch hour. This dialogue was verbal (telephone) and typed (electronic mail) and initiated by the student.

Dialogue can also be initiated or provided for as 'guided didactic conversation' by the writer of correspondence materials. Bååth (cited in Keegan 1990) describes his experiences in this context:

> When writing correspondence materials I was struck by the idea that it was possible to provide some kind of two-way communication within the material, by means of exercises, questions or self-check tests with detailed model or specimen answers. Could such two-way

> communication, to any considerable extent, replace the postal two-way communication induced by assignments for submission? (pp.11-12).

The student workbook implemented many elements of Bååth's ideas on materials based dialogue. Exercises and self-check tests based on detailed models were included in the workbook. Keegan (1990) on writing about the work of Bååth, states:

> Two-way communication in writing and on the telephone between students and tutors has been one of his chief concerns. Students' assignments are regarded as facilitators of this communication rather than as instruments of assessment. (p.89).

Bååth's 1979 analysis (cited in Keegan, 1990) of the teaching models of Skinner, Rothkopf, Ausubel, Egan, Gagne, Bruner and Rogers led him to develop further his thoughts on two-way communication in correspondence education. Holmberg (1982) confirmed the applicability of those teaching models to distance education. Holmberg used the telephone as one example of simultaneous non-contiguous communication. Today another example could be SSCMC.

> Bååth's analysis of teaching models concludes that:
>
> •models with stricter control of learning towards fixed goals tend to imply, in distance education, a greater emphasis on the teaching material than on the two-way communication between student and tutor/institution; and
> •models with less control of learning towards fixed goals tend to make simultaneous communication between student and tutor/institution more desirable, this communication taking the form of either face-to-face or telephone contacts (p.21).

By 1980 Bååth (cited in Keegan, 1990) stated that two-way communication was a central theme to distance education. In this study, the students were informed, by the tutor at the outset of the course, of specific fixed goals for the training, that is, the completion of a minimum of four tests. The students were then informed of student choice and control over their learning towards those fixed goals. Students were also informed that they could decide on the sequence of their learning and exercises completed, or the number of additional tests they could choose to complete.

This reduced control of learning towards fixed goals was communicated to the students at the outset of their training by the tutor, and is consistent with Bååth's

analysis of teaching models, and should have enhanced the likelihood of simultaneous communication between the student and the tutor.

Bååth (1982) had further determined that the student required special help with the start of study and that the tutor to student interaction at that point was important particularly to promote study motivation. Bååth's determinations have been supported by researchers in other forms of CMC (Florini, 1989; Mason, 1988; McCreary and Van Duren, 1987; Naidu, 1988), who point out the need to help students and tutors at the start of a computer conferencing course with additional training and ensuring students and tutors confirm contact with each other.

In this study, a student-site assistant was scheduled to help the students embark on their learning process. This student-site assistant was responsible for ensuring that the student knew how to operate the videotape and that all the required learning materials and technical media were available in the learning room. This student-site assistant was also required to contact the tutor via the technical media to verify that all the equipment worked in order to provide evidence of its operation for the student and the tutor. At that point, the student was required to call the tutor via the telephone for two reasons. Firstly, to confirm with the tutor the method of learning and the appropriate use of the media for learning purposes. Secondly, to confirm personal access and availability of the tutor, thus promoting motivation to study. This procedure was consistent with Bååth's suggestions for help with the start of study and study motivation.

In this research, the tutor was able to receive, mark and return, tests and assignments within a short period of time, usually less than 10 minutes. This 'instant' submission, evaluation and interactive-feedback on tests and assignments was implemented in this research to overcome difficulties in distance education such as "sustaining motivation" and "isolation of the learner" (Naidu, 1988).

Issues Surrounding the Separation of the Learner From the Learning Group.

In this study, all students studied on their own in an independent manner. A learning group did not exist. A number of independent learning activities, as well as interactive activities were designed into the learning materials. The issues surrounding this area of learning are the same as those that attach to notions of independence of the student (Moore, 1983; Wedemeyer, 1973), interaction with the tutor or other students (Daniel & Shale, 1979; Holmberg, 1983; Sewart, 1980,1981) and 'privatization of institutional learning' (Smith cited in Keegan, 1990) .

Daniel (1979) sees independent activities as reading a text, watching television at home, conducting a home experiment and writing an assignment. He sees interactive activities as discussion on the telephone, marking and commenting on an assignment, group discussions and residential summer school. Independent activities, he tells us, have great possibilities of economies of scale since the marginal costs of printing extra copies of texts or broadcasting to more students are low. The cost of interactive activities tends to increase directly in proportion to the number of students.

In this study, the independent activities were the viewing of a videotape for lesson delivery, exercises that interfaced with the videotape and reinforced the learning, and completion of tests that were required for submission to the tutor for marking.

The interactive activities were student initiated contact with the tutor over the telephone, shared screen interaction using the SSCMC software in reference to learning difficulties, typed messaging, transmission and reception of tests, and shared screen interactive discussions regarding marked assignments.

Sewart (cited in Keegan, 1990) states that distance education has many advantages and disadvantages when it is compared to conventional education. The advantages are:

1. freedom from the limits of the classroom;

2. ability to study whatever, whenever, wherever;

3. freedom as a result of the distant student's individual situation;

4. the learning patterns of the group don't limit the distant student;

5. the individual's needs are not subservient to the group's needs.

The disadvantages are:

1. the missing formal group as a measure of progress;

2. the missing formal group as a measure of success and failure;

3. the missing formal group as a forum for clarification or discussion on the pressure of learning.

Keegan developed the concept of independence cited above as an advantage of distance education to better define it through the notion of a "private situation" in learning. He used the term 'privatization' which he felt described the reality in practice. He believed that "a distance system takes the student from the learning group and places him/her in a more private situation". He goes on further to say that "learning is often private when it is not institutionalized." (p.44). This key distinction and description of the private situation in distance education is based on Smith's work stating that "distance education is characterized by the privatization of institutional learning."

Sewart argues that the situation of the student learning at a distance is quite different from that of conventional students because of the absence of immediate feedback and because the student's peer group does not act as a benchmark. This argument is consistent with Smith's views on the privatization of institutional learning. However, neither Smith nor Sewart had the benefit of experiencing the swift, shared screen interactivity (of the student problem and tutor solution) afforded through SSCMC. Sewart's work is much earlier than Smith's or Keegan's and his conclusion "that the process of learning at a distance is generically different from the conventional mode", is questionable today, because he based it on the fact that "the swift feedback available from the face-to-face learning model is almost entirely absent." (p.177).

Figuratively speaking, face-to-face communication is much more readily available today via SSCMC, videoconferencing and teletraining. In the context of this study, however, it is not necessary to see the person's face in order to communicate effectively the student's learning problem or the tutor's solution. To add further to this argument, the immediate availability of the tutor or other students through SSCMC, to the student, may also void some of Smith's arguments about the lack of access to benchmarks regarding behaviour and performance.

Conclusions

"One of the most striking features of much of the CMC research published to date is the type of research samples that have been examined. These examples have consisted of undergraduate or graduate students who had familiarity with computers or with computer technology or were interested in computer related issues before getting involved in the CMC research activities" (Harasim, Hiltz, MaCreary & Van Duren, Siegel, Dubrovsky, Kiesler, & McGuire, cited in Ahola-Sidaway, Maclean & Truehaft, 1990).

There is a plethora of issues that may have been ignored as a result of this focus on computer literate, university student, samples. The teacher and learner separation may have become a smaller problem when dealing with individuals who already may be able to learn on their own. These people (undergraduates and graduates) may more easily be encompassed within the description of a student as a rational, independent, autonomous, self-willed, person possessing special qualities that Moore and Wedemeyer refer to in their research. These individuals may not fall as easily within the group of people, referred to by Willen, Bates and Daniel & Shale, who require practical, real world, institute guided and paced distance education.

Graduates' and undergraduates' learning materials needs and methods may be very different when compared to similar needs of adults in the workplace. The preparation of learning materials used for the different groups has not been adquately addressed in distance education. The field of adult education is beginning to address some of these issues, although research evidence indicates that learning materials development still tends to follow the traditional models.

As technology improves the teachers' ability to access, support and interact with students, they are faced with many questions. How to deal with the loss of teacher control over learning? What is the appropriate use of technology? Can students' learning improve through the use of technology? How can teachers maintain and support these changes. Many questions still arise about the most effective media mix to use to enhance learning. Questions arise about slick television and entertainment versus sound education (Lane, 1989). Is distance education delivered through multimedia and television sound education worthy of credit? (Bates, 1987). In the face of so many questions, the traditional use of correspondence materials and media (print media and the postal mail service) is still the most prevalent distance education strategy.

Presently, communications technology, especially computer-mediated conferencing, has become easier to use, more available and economical, and facilitates real-time two-way communication. Research indicates that there is also a greater understanding of educational materials development, and this facilitates the development of two-way communication within students' learning materials. Research surrounding teaching-learning models facilitates the development of appropriate learning strategies, and the discovery of when those teaching-learning strategies encourage greater two-way communication between the student and tutor.

Research indicates that students, especially in the workplace, prefer to learn in private situations, separate from the learning group or without ever being part of a learning group at all. This has advantages and disadvantages. The availability of

SSCMC may add to the advantages of students learning on their own separate from a learning group.

This review of the related literature highlights the complexity of this area of research and the fact that very little comprehensive research exists in this area. The issues addressed in this review of literature have become of vital importance today and require extensive and exhaustive research. This thesis provides one small piece of evidence on the efficacy of one of the options available to the distance educator and the educational institute.

Chapter 3

RESEARCH DESIGN

In this study, ten students were taught how to operate Microsoft Excel™ using a videotape and a specially prepared self-directed learning package. SSCMC was used to support the self-directed students during the scheduled training period.

The basic design of this study is outlined first, following this outline, the rationale for adopting the research design is discussed. The form of the initial student contact, the process used to select learning materials and course delivery are described next. Then the pilot study and equipment tests are outlined. These are followed by details of the data collection method and data collection instruments. Finally, the reliability, validity and integrity of the data are addressed.

Study Design

Research Framework

This study used a qualitative, naturalistic research approach (Ahola-Sidaway, J., MacLean, M., Treuhaft, J., 1990; Everhart, 1988). There were three reasons why this research design was selected.

First, as noted earlier in this study, SSCMC is a relatively new phenomenon in distance education and as a subject for research studies. No evidence of published research was found which investigated SSCMC applications involving company employees, learning in a private situation at work, through the use of a videotape and exercise workbook for subject matter delivery, and supported by a distant tutor via SSCMC. Everhart (1988) states that in situations where there is limited or no research, it is appropriate to use an exploratory, descriptive research design. For that type of research design, the emphasis is on discovery and documentation rather than on testing and refinement.

Secondly, the types of questions used to guide the research also pointed to the use of a naturalistic approach. Therefore, this study reported participants' views with reference to this study and documented their SSCMC experiences. This report also documented each individual's transformation from a non-user of SSCMC to a somewhat experienced user.

Thirdly, the researcher was both the materials developer and SSCMC tutor. The tutor documented his experiences and observations in the tutor log. By documenting his participation in the study the tutor was able to turn such issues as subjectivity, observer bias and reactivity into methodological strengths rather than limitations (Lincoln & Guba, 1985).

Initial Contact, Selection of Students, Equipment, and Training of Student-site Assistants.

In September 1989, the researcher met with representatives of a large national telecommunications company to establish their interest in conducting an experiment in SSCMC. This meeting involved a demonstration of SSCMC to these representatives, to show how it worked. They indicated a willingness to participate as a corporation, though they stipulated that the participation by their employees, to act as students, should be on a volunteer basis.

The researcher selected an existing self-directed video course from amongst materials which the representatives of the company were evaluating for their training needs. This video course was a six hour course in Microsoft Excel™ developed by Microsoft Corporation. The management of the host company for this research had recently standardized on corporate-wide use of Microsoft Excel™, consequently, many employees needed training on this software package. The researcher reviewed this self-directed video course and found it needed enhancing for use with SSCMC. The researcher developed the enhancements to the video course learning materials. A

course outline, workbook and SSCMC instructions for students were prepared. This new self-directed learning package was validated by content experts and instructional designers.

The host company set up a learning room equipped with the SSCMC equipment required for this study. This equipment is detailed in Appendix C. A pilot study which occurred during the period May 8th to May 29th, 1990, was a required part of the research design. Two student site assistants had been identified, and the researcher trained them for their role using SSCMC. These student site assistants tested the Microsoft Excel™ and SSCMC learning materials during phase one of the pilot study. This initial testing provided sufficient first hand experience to the student-site assistants and also facilitated the reduction of equipment and procedural difficulties. Two other employees were directed by their supervisors to take part in stage two of the pilot study. One additional employee was assigned to this study for data communications support.

The researcher developed a poster (Appendix D) to solicit volunteers for this study. Ten students volunteered and all were registered in the course. Courses began May 30th, 1990 and ran for 38 consecutive days until July 7th, 1990. On any given day, only one student had access to SSCMC, since there was only one self-directed learning package available.

The SSCMC room housed all the audio visual equipment and print materials for Microsoft Excel™ as well as the SSCMC hardware as follows:

Audio Visual Equipment:

- One half inch VHS video recorder/player.
- One colour television.
- Microsoft Excel videotape.

SSCMC Equipment:

- One MSDOS microcomputer and Microsoft Excel software (Appendix C).
- One 2400 baud modem.
- One single line telephone.
- One SSCMC software package : Cosession™ Host.

Other educational equipment was also in the room and was being used which meant that people were coming and going throughout the study. A similar arrangement of equipment was set up in the tutor's home.

Pilot Study

A pilot study was carried out between May 8, 1990 and May 29, 1990, in two phases. The first phase involved two student site assistants. These individuals were trained in their support role for SSCMC, this training being performed using SSCMC technology. This phase of the pilot study identified incompatibilities associated with the use of current microcomputer technology and the version of Cosession™ software purchased for use in this study. The equipment configuration available for use in this study was different from that used in all the demonstrations and prior tests of equipment and software. Initial problems surfaced when the tutor attempted to help the student-site assistants install and test the SSCMC software. Difficulties also occurred because the data communications equipment used in this phase of the study was faulty. A data communications specialist at the student site helped the tutor identify the faulty equipment which was replaced by the student site assistants.

Configuration difficulties occurred in the use of different versions of Cosession™, Microsoft Excel™ and PC/MSDOS to those used in earlier demonstrations. As a result of these difficulties with the operating system, it was decided by the tutor that MSDOS version 3.30 would be used instead of version 4.01 which was causing memory errors. The multi-line telephone set in the learning room

was found to be unsuitable for direct link with the modem for the purposes of this study. This telephone set was linked to a local switchboard. Earlier testing had successfully determined that other multi-line telephone sets, could be used for this study with a parallel line switch linking the telephone, modem and microcomputer (Appendix E). As a result of this problem, an independent telephone line was installed in the learning room to overcome the local switchboard and multi-line telephone set limitations.

A software upgrade for Cosession™ was purchased to overcome difficulties associated with the earlier version of Cosession™ and its operation with the equipment and Microsoft Excel™ software in the learning room.

During the pilot study, tutor impatience and frustration resulted due to uncertainties associated with the waiting for telephone calls, and the lack of clear instructions for an end of communication signal. It was discovered that the students were getting impatient and would hit the return key or other keys, without waiting for a response from the software. When the student site assistants tried to get the software to work faster by hitting more and more keyboard keys, the opposite occurred. These keystrokes were queued by the software and executed one by one. Consequently, students lost track of where they were or they eventually "locked-up" the keyboard. Keyboard lock-up and processor freeze-up were some of the initial indicators of improper setup and usage of Cosession™.

These types of problems are generally indicators of poor training or poor software design. It appeared that the software couldn't handle problems such as incorrect procedure. The developers of the software were contacted. They suggested that these problems may have been caused by an inaccurate installation of the software. They suggested the correct software settings for the equipment being used (Appendix F). These new settings were made in real time at a distance and tested by the tutor. In addition to the setup, communications guidelines for use of Cosession™ were

developed for the students. These guidelines were scheduled to be communicated by the tutor to the students at the beginning of each student's training session on SSCMC.

The second phase of the pilot study commenced with two employees who had not been involved in the pilot up to this point. These two employees were scheduled for training sessions. The first student was trained in the use of the equipment and materials by one of the two student-site assistants. Then this student-site assistant, in the presence of the student, tested the Cosession™ link to the tutor, thereby demonstrating its operation to the student and the tutor. After this demonstration student training on SSCMC commenced. Equipment and procedural problems arose again at this point and the SSCMC training became a problem solving session on why the SSCMC wasn't working. The student became an observer of the difficulties associated with SSCMC.

In order to limit possibilities for frustration with the equipment and software, the tutor changed the "start of training" procedure, and eliminated the need for front end SSCMC training. The amount of training in SSCMC features was further reduced to only the essential elements and it was now scheduled to occur after completion of the first three to four hours of the videotape and workbook study. This was done to ensure that the student would always have educational activity to carry on with even though equipment and communications difficulties may have arisen. This procedure was adopted to ensure that system problems at the start of the research study would not result in wasted student time.

One of the pilot study participants was very patient with some of the procedural failures and equipment lockups and was a willing participant in helping to solve the equipment problems. The other person was a busy individual who didn't appear to be comfortable with any equipment or procedural difficulties associated with the delivery of training. Both individuals were instrumental in changing the design and delivery of the SSCMC and Microsoft Excel™ training.

As a result of this process, the researcher was able to overcome some of the difficulties associated with materials, equipment and the tutor-student interaction. It took three weeks to identify and rectify equipment and procedure problems. The pilot study was crucial in identifying where the initial set up of Cosession™ was inaccurate, how keyboard lockup and processor freeze-up could occur with improper software settings, and alternate procedures required for this training. Problems associated with teaching SSCMC at a distance using SSCMC were identified and changes to the delivery of this training from the original design were implemented. Inaccuracies in the workbook were identified as were the use of key words for communication purposes. One example identified in the workbook had inaccurate cell addresses in 3 exercises and some ambiguous instructions, which hadn't been identified in the materials validation phase or in the first phase of the pilot test.

Other equipment in the learning room was also in use for other forms of training. Other users of the learning room sometimes used the resarch study microcomputer to connect to their mainframe account. This alternate use occurred either early in the morning, before the student's training started each day, at lunch hours or at the end of the day. The alternate use of the equipment required the use of a different communications software package and keyboard configuration. The net result of this multiple use was a regular interference with the problem free operation of SSCMC during this study, which may be typical of real life. When the alternate use of the microcomputer was discovered (by accident) a new procedure was developed by the tutor. This procedure when instituted allowed the student or the researcher capabilities to power down the system either locally or remotely. In this way, the modem and the microcomputer were initialized at the beginning of each training session. The modem and microcomputer were physically powered down and then turned on by the student-site assistant at the start of a new student's learning session. By the second day the

student assumed responsiblity for this modem and and equipment initialization procedure.

Two versions of Cosession™ were installed on the machine in Calgary. This caused confusion and increased complexity and deficiencies in the SSCMC operation during this pilot study. To rectify this problem the Calgary microcomputer's hard disk directories, program files, data files, and the autoexec.bat file were modified from Edmonton, by the researcher, through SSCMC. The reinitialization for the Calgary version of Cosession™ was also done by the researcher from Edmonton, through SSCMC. The ability of the SSCMC software to allow for this type of remote correction and reinstallation of the software was remarkable and a significant factor in the successful use of SSCMC for this study.

During the pilot study, the procedure for documenting the student call was refined. The use of keywords allowed the researcher time to note events in context. This was invaluable to the researcher during later reviews of the session. The researcher hadn't tutored at a distance before and it was extremely useful for him to discover that there were various levels of listening and communications skills required of him. During the pilot study, the researcher also realized that he would have to improve his documentation skills.

Course Delivery and Tutor-Student Interaction Design

At the beginning of each new student's scheduled session in the learning room a student-site assistant was present to familiarize students with the equipment, the learning room setup and tutor contact procedures. Then the student-site assistant left the students on their own, with no safety net except tutor access by telephone.

The student site assistant demonstrated, once for each new student, the use of SSCMC to link to the tutor. This allowed the tutor to verify that the equipment was working correctly. The reason for doing this was to separate technical difficulties from

pedagogical difficulties. By demonstrating the operation to the student the tutor wanted to instill confidence in the student about the ease of use of the SSCMC package. At the same time, the student was able to confirm visually that the technology and its usage was not complex. The tutor hoped to reduce the student's fear of the technology through the implementation of this procedure.

At this point in time, an initial contact was made by the student with the tutor via the telephone. This introductory telephone call was felt necessary for motivation of the student, familiarization with the tutor and to allow the tutor to explain further the use of the learning materials and the reasons why certain exercises were included in the workbook. As Stated by Romiszowski (1986) "adults do not learn a given topic satisfactorily because they do not really believe it has any relevance to their real life situation ... ." Consequently, this contact was used to establish relevancy of the learning materials to the student's real life situation at work.

During the introductory telephone call, the pacing of the course was discussed. Daniel & Shale (1979) suggest that to ensure success in distance education, pacing should be an integral part of the course. Pacing, however, could have been viewed as threatening by the student. Boyd (cited in Keegan, 1990) suggests that courses for adults should be non-threatening and non-dominative. In order for the student to regard this training as being non-threatening and non-dominative, the tutor communicated pacing in the following two ways to the student. Firstly, pacing was communicated as a form of goal setting which provided a guideline for time management. Secondly, that the students were not being evaluated relative to those expectations. If students did not get to a particular point in their work by a particular time, this was not viewed by the tutor as a serious problem and was communicated in this way to the student.

In addition to the discussion on goal setting, the tutor scheduled a time slot with the student for training in the use of SSCMC. The possibility that learning difficulties

could arise before the student's training on SSCMC had occurred, was discussed, as were details on how the student should contact the tutor, in that instance, using the telephone (Appendix G). This discussion was felt to be important in order to establish the personal contact between the student and the tutor to aid study motivation and minimize isolation of the student.

The SSCMC software allowed the tutor and the student opportunities to record any SSCMC sessions between themselves. Both the tutor and the student were able to record a SSCMC session and keep it as a computer file on their own computer. This recording could then be replayed at any time at the convenience of the tutor or the student.

The tutor also was able to replay from the computer file exactly what the student had requested and what the tutor's response had been. This allowed the tutor opportunities to clear up any misunderstanding over instructions given or problem description received. This also allowed the tutor opportunities to verify that the procedure(s) the tutor had asked students to follow, to overcome their learning difficulties, had in fact been attempted and with what degree of success.

When students completed their tests and wanted to submit them for marking, the students contacted their tutor by telephone, a voice to data link was effected, leading to the tutor transferring the student's files to the tutor's machine. Students could complete one or more tests before submitting for marking, depending on their confidence in their own performance in reaching learning objectives set out in the workbook. This allowed students control over the amount of interaction with the tutor. In allowing the tutor opportunities to transfer students' files, the tutor was further able to remove technical difficulties from the pedagogical process.

Once the tests were marked the tutor returned them to the student using SSCMC. An explanation of the marking was included on the submitted work. The test file was then sent by the tutor to the student machine, through SSCMC. The tutor, in

every case, reviewed the marked tests and/or assignments with the student using SSCMC.

In all cases of tutor-student interaction, whether SSCMC based or telephone based only, the tutor, kept a detailed diary of all calls and of critical events that occurred, scored assignments and tests and returned them to the learner in 10 minutes or less.

Data Collection and Data Collection Instruments

Data were collected prior to the SSCMC experiment, during the SSCMC experiment and after the SSCMC experiment.

Data collected prior to the SSCMC experiment.

1. The researcher maintained a personal journal (this is different from the tutor log). This journal detailed the kinds of interaction that occurred with different companies at different stages of this thesis development. The journal included details of activities associated with the use of real time two - way voice and video communications, for meetings used to negotiate contributions and discuss progress on this study.

2. At the beginning of students' scheduled training sessions, they were asked to complete a questionnaire by the student-site assistant (Appendix H). This facilitated the gathering of data related to the nature of the students.

Data collected during the SSCMC experiment

1. A hand written log was kept by the tutor detailing date, time, reason for contact and tutor's perceived success or failure of the student contact for help. A sample of the tutor log appears in Appendix J.

2. For each student contact with the tutor, which necessitated a shared screen interaction over the problem, a record of the common session was kept on the

tutor's machine as a Cosession™ computer file, by the tutor. This contains the complete question and answer session as it occurred between the student and the tutor.

3. The tutor kept copies of evaluated student tests for all students who submitted tests to the tutor for marking. Students were aware of this form of data gathering during the research. These tests were not special, but those enclosed in the learning materials package and required for course completion. A typical set of computer files for one student, including assignments and tests, is shown in Appendix K as a directory of computer filenames.

Data collected after the SSCMC experiment.

1. Each student was asked by the tutor to complete a questionnaire gathering data on attitudes toward distance education using SSCMC (Appendix L). Questionnaires were collected by the student-site assistant and returned to the researcher.

The Reliability, Validity, and Integrity of the Data and Methods Used in this Study

As in any experiment, there are many factors which could have influenced the results of this study. The results of this study may have been affected quite significantly by the students' perceptions of being "on stage" (Petruk, 1975). The fact that new methods of distance education were being attempted and the fact that the course was advertised as such may have attracted individuals who were extroverts or high achievers and already comfortable learning on their own. This could have affected achievement scores and motivation to complete. The company, which supplied the students, was a large telecommunications company. It is possible that individuals taking part in this study may already be comfortable with telecommunications

technology or if not, unlikely to admit their discomfort publicly and consequently much more likely to use SSCMC.

It is also possible that students may have used the telephone to call someone locally or physically sought the help of a local expert, rather than contacting the distant tutor. The student was not monitored continuously throughout this study, so consequently it is also possible that the student may have spent less time on task than was allocated for the learning.

The researcher was also the tutor, and this could have affected the tutor's ability to gather the data in an objective manner.

While it is not possible to determine the extent to which these factors influenced the results of this study, the nature of this kind of study is to document the students' and tutor's experiences with SSCMC.

Data Analysis

Content analysis was used to examine the tutor's log and the shared screen interaction log, for answers to the research questions. Additionally any themes that may have emerged from the data were noted. The questionnaires were analyzed by a frequency analysis for all variables and are presented in tabular form.

Chapter 4

FINDINGS OF THE STUDY

In this chapter, the results of the analysis of the data are discussed according to categories which arose from the data and are written up under the major research questions.

The categories which are discussed evolved from an analysis of the tutor's log about the various experiences of the tutor in using SSCMC, the role of the tutor in SSCMC, the interaction with the students, and the interaction of the tutor with the company's student-site assistant. Underlying themes, potential future uses of the data and future trends will be discussed in the final section.

Profile of the students

A short questionnaire was designed and administered to each student in order to collect information that would make it possible to describe the nature of the students in this research. The questionnaire was enclosed in the learning materials package and administered to the student, by the student site assistant, at the beginning of each student's learning activity. The student site assistant returned the completed questionnaire to the tutor. Nine of the ten students completed their questionnaires and gave them to the student site assistants. One student completed the course but did not hand in the pre-course or post-course questionnaires. Both of the students that dropped out of the course completed their pre-course and post-course questionnaires. This indicates that these two students had decided to end their course of study even though they had not finished the required work. The data gathered by this questionnaire is presented in Table 1. The following pages present the data gathered.

Pre-course Questionnaire Data

TABLE 1.

Demographic Data

Present Position:	
Management	5
Supervisor	1
Technical	1
Clerical	2
	9

Sex:	
Female	4
Male	5
	9

Area of Expertise:	
Telecommunications	1
Accounting	2
Engineering	1
Secretarial/Clerical	2
Distance Education	1
Information Centre	1
Programming	1

Years at Company:	
2-5 years	5
6-10 years	3
11-15 years	1
	9

Age :	
Under 25	1
25-29	5
30-34	3
	9

Education and Related Computer Experience.

Education:	
Bachelors Degree	2
Diploma	3
Diploma (incomplete)	2
Grade 12	9

Previous Computer Courses:	
Introduction to Microcomputers	4
Introduction to Disk Operating System (DOS)	7
Introduction to Lotus 1-2-3™	6
Introduction to Microsoft Excel™	0
Introduction to Database (DataEase™ or dBase™)	3
Introduction to Wordprocessing (any kind)	5
Data Communications	2
Local Area Networks	1
Basic Programming and SAS	1
Harvard Graphics, Accpac and PCTools	1
Cobol, Pascal	1

Distance Education Background, Reasons for Taking This Course:

Previous Videoconferencing experience	
Yes (2) No (7)	
Enjoyed it a lot	1
Neither like nor dislike	1

Previous Correspondence Course(s)	
Yes (6) No (3)	
Enjoyed it a lot	2
Enjoyed it	3
Neither like nor dislike	1

Previous Electronic Mail Experience	
Yes (9) No (0)	
Profs™	9
Bulletin Board	3
Envoy	2

Reasons for Taking This Course	
Want to learn about Microsoft Excel™	8
Want to improve spreadsheeting skills	5
Expected to learn this new package	3
Interested in getting a certificate	2
Want to learn about computer conferencing	2
Like to learn on my own, at own pace	4
Experience and apply in distance education	1
Asked to take this course	1

The youngest student was approximately 22 years old, the oldest student was approximatley 32 years old. Most of the students were in the 25-29 years age range. All the students indicated at least a grade 12 education. Two students indicated continuing studies at the college diploma level, three students had completed their college diplomas. Two students had completed a university undergraduate degree .

Five students in this study held managerial positions, one student was a supervisor of staff, one student held a technical position and two students held clerical positions in the same company.

Five of the students in this study had been employed by the company less than five years. Three students had been employed by the company between 6 and 10 years. One person had been with the company for more than 11 years. Four students in the group were female.

A wide spectrum of backgrounds was found. One person listed telecommunications as a specialty. Two people had accounting specialty backgrounds, one person had an engineering background, one person was an educational specialist, one person had computer programming listed as a specialty, one person listed being an information centre specialist, and two people listed themselves as secretarial or clerical specialists. This sample provided a fairly wide cross-section of the specialty backgrounds found in this company.

All of the students in this study had varying degrees of experience with a microcomputer. Eight of the students indicated that they had previously taken related microcomputer courses. The one individual who did not indicate prior microcomputer courses indicated having had work experience in the use of the microcomputer. Seven individuals had prior education or work experience with a similar software package to that used for the subject matter in this course. Nobody in the research group reported previous experience in the subject matter of the course in this study.

Two students in the research group indicated receiving prior courses in data communications. Only one person had prior experience with local area networks. This person is one of two people who had prior data communications courses. This person was a telecommunications specialist and experienced no difficulties at all during the learning process or in the use of SSCMC, nor, however, did the majority of the other students.

Seven students in the research group had never taken a videoconference course. Of the two students in the research group who had taken videoconference courses, one liked them and found them productive and the other neither liked nor disliked them. The majority of the students in this group had not been exposed to videoconferencing technology before. This is probably typical of employees in other large companies.

All of the students in the research group had used electronic mail before. All had used the mainframe electronic mail facilities (Profs™) and three students in the research group had used a bulletin board. These three individuals had direct experience with microcomputers, modems, data communications software and protocols. Six students in the research group had taken a correspondence course before. Five of the six students with correspondence course experience had enjoyed it or thought that correspondence courses were useful and productive. Four of the nine students in the research group indicated that they prefer to learn on their own, at their own pace.

When asked if they took this course to learn the subject matter of the course being delivered, Eight of nine students in the research group answered positively. The other person did not respond at all to the question. This one student had been asked to take the course and indicated so in the questionnaire. This student did not complete the course.

Five of nine students took the course to improve their skills in this subject area (spreadsheets). Six of the nine students had previous Lotus 1-2-3™ experience. Only three students were expected to learn this software package for their work

requirements. Two students students indicated that one of their reasons for taking this course was to learn about computer conferencing. Two students said they were interested in getting a certificate for this course.

This completes the student profile. The data relating to the specific research questions are now presented below.

1. Does tutorial assistance supported by SSCMC contribute to learning as measured by: a) achievement; b) proportion of students completing the program; and c) time taken to complete.

a. achievement.

Ten students whose duties at work required them to know Microsoft Excel™ were registered for the training. The students scheduled their training with the student-site assistants based on the availability of the one training station. Consequently, each student had different start and completion dates for their training.

The average mark for the completed tests was 88.75 percent. Of the eight students who completed the four submitted tests, two received a mark of 100 percent , three students received a mark of 90 percent, and three students received a mark of 80 percent.

The tests were regarded as being neither hard nor easy. The tests took the form of a spreadsheet exercise which required the use of a set of knowledge and skilled accomplishment of operating procedures learned from the videotape and reinforced by the workbook exercises. Students had full opportunity to reuse the videotape, their own notes or workbook in order to complete the tests. The tests were designed to be of moderate difficulty because Chacon-Duque in his study (cited in Cookson, 1989) found that moderate difficulty of tests and learning materials appeared to enhance both completion and pass rate.

b. Completion rate.

Eight of ten students completed the course successfully. Two students dropped out of the course as a result of work related issues.

c. Time taken to complete

The eight students that completed the required tests finished their training well within the time limits set. Two students had completed all of the required tests within the first day of training (7 hours). Two students completed their tests by the end of the morning on the second day (10.5 hours). Two others completed their work by 2.00 p.m. of the second day (11.5 hours) and the last two students had completed by 3.30 p.m of the second day (13 hours). Two students did not complete the training. One dropped out during the first day of training and did not start the SSCMC training. This person however successfully completed the first three practice exercises and the first test. The other student completed the first two tests and nine of the available seventeen exercises, but dropped out owing to scheduling problems, lack of time and work pressures.

The researcher had worked through the course materials as a student would go through them. He had completed this trial run in 4 hours. By using a three to one ratio, the researcher had allowed 12 hours for the course completion and 2 extra hours for a safety margin. Students commented positively on the time allocation and design of materials for the course.

2. To what extent did SSCMC contribute to the communication of learning problems and the subsequent resolution of these problems back to the student?

All of the students in this study faced learning difficulties during their training sessions. Many of these difficulties were due to inadequately prepared teaching materials, ambiguous instructions, accidental keying errors, specialized setups and improper sequencing of instructions by the student. In some cases the problem and solution were verbally communicated. In other cases the problem description was too

complex to effect verbally. In these cases the communication difficulty identified itself quickly.

Both the tutor and the student realized that in situations where complex learning problems had to be communicated a shared screen interaction was required. For example, when a student wanted to change fonts in the worksheet for a particular cell, the procedure was not clearly identified in the videotape or the student workbook. The student was unable to explain the problem verbally, so the tutor and student used SSCMC to complete a shared screen interaction. The student then used Microsoft Excel screens and screen menus to illustrate the problem to the tutor. The tutor, having at last understood the problem, demonstrated the settings required to solve the problem. The tutor explained the solution by typing his messages and also by physically demonstrating the solution on the shared screen interaction.

In another instance, the student had not noticed a procedure to hide columns in Microsoft Excel™ when it was shown on the videotape. This student also questioned the need for the procedure. On the student's request for instruction, SSCMC was used to deliver the instruction and justifications for the procedure. This student also required personal confirmation of the teaching-learning methods and the places where the student workbook interfaced to the videotape. This confirmation and information were communicated to the student via SSCMC.

This same student later initiated a telephone call to request help in building a formula as per the workbook instructions. The formula that the student had built was declared invalid by the software, and the student felt it had been correctly built. Verbal problem communication and attempts at verbal solution of the problem having failed, the tutor and the student went into shared screen interaction using SSCMC. The declaration of the formula as invalid was immediately noticeable to the tutor, but the solution was not. It required detailed visual verification of how the formula had been built, before the solution was found. A lowercase letter j was included in the formula

instead of an uppercase lettter J. This problem quite possibly may not have been solvable verbally, unless the verbal formula description had included upper and lowercase descriptors prior to each letter or character.

In another example that required shared screen interaction, the tutor did not believe that what the student was describing was possible. In fact, the problem would never have been solved by the tutor if the shared screen interaction had not provided evidence of what the student was experiencing.

SSCMC was responsible for ensuring that nine students out of the 10 who took the training received timely and accurate help with difficulties in learning or problems associated with operating the software. It is possible that these students may have dropped out of the course if these problems had not been resolved quickly and to the student's satisfaction.

3. What were the student attitudes toward tutorial assistance supported by SSCMC?

In order to measure the attitudes of students towards SSCMC, a twenty item Likert-type scale was constructed (see Appendix L). It consisted of ten positive statements and ten negative statements about various aspects of SSCMC related training or the traditional classroom as an alternative. Students who agreed with positive statements about the classroom or classroom related training, had their agreement interpreted as a negative comment on SSCMC usage. This interpretation is possible because each student was made aware of the researcher's interest in gathering their attitudes towards SSCMC and that each person had to answer their questions in that context. The questionnaire was self-administered and had to be handed in as soon as students completed their course, and any responses were considered to be directly related to the methods or materials used in this research study. Any responses by students were viewed as a direct attitudinal commentary on SSCMC. One student failed to return the questionnaire, as a result the data analysis is based on 9 student responses.

Students responded to each item on a five-point agree-disagree scale. Table 2 presents a summary of the responses.

Post-course Attitude Questionnaire

Table 2.

	SD	D	U	A	SA
1.Video based training may be good for teaching some things but not Microsoft Excel™.	2	4	1	1	1
2. I wish other courses could be taught using this method		2	2	3	2
3. I like computer conferencing.		2		6	1
4. When I don't understand something, I can re-run that segment of the video tape, the teacher isn't always so compliant		1	2	5	1
5. When i run into a problem, I can always ask the teacher in the classroom, I can't do that with a person I can't see at the end of a telephone line.		5	2	1	1
6. When you work on this system you never know where you are in comparison to the rest of the class.		1	1	5	1
7. There were too many practice problems in the workbook.	2	5		2	
8. I feel more at ease in a regular classroom.	2	3	1	3	
9. If a friend told me he was thinking of taking this course I would encourage him to take it.	2			4	3
10. I would like to take the advanced course in Microsoft Excel using a video tape and distance tutor approach.	2		1	4	2
11. In the classroom, I work harder because of the competition.	4	4	1		
12. When the teacher asks me a question in the classroom I get embarassed	2	5	1	1	
13. I don't like using the computer to communicate with the teacher.	1	4	1	2	
14. If I had to do this all over again I would rather take the course this way	1	1		5	2
15. I like to use the telephone and computer conferencing		2		6	1
16. When I learn using the videotape, I don't feel like I'm competing with all the others in the class session.		1	3	5	
17. I miss the coffee breaks and complete day away from work that you get with a classroom course.	1	5	2	1	
18. I am unable to really learn in two hour gaps, I need the whole day to learn anything substantial.	3	2	2	2	
19. In a classroom you can always ask the person next to you if you get stuck or can't figure out a problem, you can't do that with computer conferencing.	6	2	1		
20. I am able to concentrate more when I am learning alone.			1	5	3

SD = Strongly Disagree D = Disagree U = Undecided A = Agree SA = Strongly Agree

The following is a detailed analysis of the student responses to various negative and positive statements about computer conferencing presented in Table 2.

Statement 1. Video based training may be good for teaching some things but not Microsoft™ Excel™.

Six of the students disagreed with this negative statement about learning the subject matter using SSCMC. Two students agreed with the negative statement, indicating that they didn't think that this was a good way of learning the subject matter. One student was undecided. Of the two people who agreed with the negative statement, one person had been asked to take this course and appears to have taken the course unwillingly.

Statement 2. I wish other courses could be taught using this methodolgy.

Five students agreed with this statement. Two students disagreed, and two students were undecided. Of the two that disagreed, one had been asked to take the course and did not spend more than one quarter of the time allocated to the learning on the learning tasks. That individual indicated to the student-site assistant that the course was too difficult to complete, yet this student never communicated any learning difficulties to the tutor. The student's work also didn't indicate failure to understand as the student was successfully able to apply the concepts delivered by the videotape for the first segment of training.

Statement 3. I like computer conferencing.

Seven students indicated that they liked computer conferencing. Two students indicated that they disagreed with this statement.

Statement 4. When I don't understand something, I can re-run that segment of the video tape; the teacher isn't always so compliant.

Six students indicated that they agreed with this statement, two students were undecided and one student disagreed with this statement. It is possible that the students who disagreed or were undecided about this question, may have had very positive experiences with teachers. Consequently, it is difficult to fully agree with this statement.

Statement 5. When I run into a problem, I can always ask the teacher in the classroom, I can't always do that with a person I can't see at the end of a telephone line.

Two students agreed with this statement. This indicates that they may have found the communication process difficult to work with. It may also indicate that the technology caused them discomfort. One of the students who agreed with this statement found the whole course too difficult. It is possible that it was the technology that this person found difficult and not the subject matter. Five students disagreed with this statement. This indicates that those people found little or no difference between asking a teacher in a classroom a learning related question or a tutor at a distance the same question. Two students were undecided on this statement, which also indicates (though somewhat less strongly) that there was little or no difference between asking for help from a distant tutor or classroom teacher .

Statement 6. When you work on this system, you never know where you are in comparison to the rest of the class.

One student stated "who cares" in response to this question. This may indicate that this person was unconcerned about her/his personal performance relative to a group norm. Six students agreed with this statement. This may indicate that students want to know how well they are performing relative to a group and desire group interaction of some kind during a distance education course. This goes counter to earlier statements about the desires of students for private learning situations. This statement confirms to some degree that the learning in this SSCMC research was individualized and that some isolation (from the sense of group) may have taken place. This statement of fact towards which the student agrees or disagrees doesn't directly measure students' attitudes towards SSCMC. However, it provides some insight into students' views on isolation and valuation desires in reference to group norms

Statement 7. There were too many practice problems in the workbook.

Seven students disagreed with this statement. This question can be used towards an evaluation of the materials designed for the course. As such it can be viewed as a positive response in support of the learning materials used in this study. Two students agreed with this statement, which indicates either that the amount of work required of the students was too much, or that they didn't like the methods used in this research study. Another possibility is that these two students were not properly informed about the correct use of the workbook and exercises contained therein. Whether this statement actually measures attitude towards SSCMC is questionable.

Statement 8. I feel more at ease in a regular classroom.

Three students agreed with this statement. One student was undecided. This may indicate that these students prefer classroom instruction over computer conferencing and video learning. It may also indicate that the students do not feel at ease using computer conferencing, and that the technology was interfering with learning. Five students disagreed with this statement. That indicates that for this portion of the group, the distance education facilitated through SSCMC may be a preferred mode of learning. It also indicates that this percentage of the group feels more at ease learning in a SSCMC environment , on their own, than learning in a classroom.

Statement 9. If a friend told me he was thinking about taking this course I would encourage him to take it.

Seven students agreed with this statement. This indicates that they were positively inclined towards SSCMC. Two students percent disagreed with this statement.

Statement 10. I would like to take the advanced course in Excel using a video tape and distance tutor approach.

Six students agreed with this statement. One student was undecided and Two students disagreed with this statement. This is a very direct question evaluating

whether students enjoyed SSCMC and want to experience it again. The majority of students enjoyed the experience and like SSCMC.

Statement 11. In the classroom, I work harder because of the competition.

Eight students disagreed with this statement. The other student was undecided. This may indicate that the particular students who chose to take part in this study, were self-motivated and worked hard based on their personal goals. These students may just dislike the classroom. If the response indicates that students dislike the classroom, it may be one reason why they might prefer SSCMC or any other method of individualized learning and support.

Statement 12. When the teacher asks me a question in the classroom I get embarrassed.

Seven students disagreed with this statement. One person agreed with it and one person was undecided. This indicates that the majority of the students have worked comfortably in a classroom with a teacher. These students appear to be confident and as such their preferences for SSCMC all the more likely to be attributable to such factors as materials, convenience, location, length of the course and the teaching - learning methods used. The other two students may have chosen this method of learning to avoid embarrassing classroom situations.

Statement 13. I don't like using the computer to communicate with the teacher.

Six students disagreed with this statement. Two agreed with it and one person was undecided. The response to this question indicates that the majority of students felt comfortable with the computer and the use of telecommunications equipment to communicate with the teacher. Three students were definitely not comfortable with this communications environment.

Statement 14. If I had to do this all over again, I would rather take the course this way.

Seven students agreed with this statement. Two students disagreed with this statement. This indicates that the majority of students may have had a positive

experience with SSCMC. Two students indicated a definite dislike for this method of learning.

Statement 15. I like to use the telephone line and computer conferencing.

Seven students agreed with this statement. Two students disagreed with this statement. This also indicates that the majority of students may have had a positive experience with SSCMC, while two people do not like this technology.

Statement 16. When I learn using the videotape, I don't feel like I'm competing with all the others in the class session.

Five students agreed with this statement. One student disagreed with this statement. Three students were undecided. This may indicate that some of the students still felt part of a learning group and competed just the same as they would in a classroom environment. It may also indicate that they were in communication with each other during the course. The majority of students, by agreeing with the statement in the context of answering questions about SSCMC, are indicating their preference for SSCMC.

Statement 17. I miss the coffee breaks and complete day away from work that you get with a classroom course.

Seven students disagreed with this statement. Two students agreed with this statement. This indicates that the two students who agreed with the statement may prefer the classroom over SSCMC for a variety of reasons. However, the majority of students prefer SSCMC over classroom instruction.

Statement 18. I am unable to really learn in two hour gaps, I need the whole day to learn anything substantial.

Five students disagreed with this statement. Two students agreed with this statement. Two students were undecided. This indicates that students feel that may be able to learn in smaller chunks rather than one whole day. This means that if they were scheduled to learn on their own for short periods of time using SSCMC they may

successfully learn. However, this statement was worded in such a way as to show preference for one day away from the workplace, which would indicate a preference for the classroom and therefore would be negative in connotation towards SSCMC. The fact that 55 percent of students disagreed with this statement indicates that they may prefer learning using SSCMC over the classroom. On the other hand, if this statement was responded to directly, then it indicates a preference for shorter duration courses, or desires for modified scheduling.

Statement 19. In a classroom you can always ask the person next to you if you get stuck or can't figure out a problem, you can't do that with computer conferencing.

Six students disagree with this statement. Two students were undecided. one student agreed with this statement. The majority of students felt that they could successfully use SSCMC to contact the tutor and get all their questions fully answered using SSCMC. One person definitely prefers classroom learning over SSCMC.

Statement 20. I am able to concentrate more when I am learning alone.

Eight students agreed with this statement. One person was undecided. This indicates that the students preferred to learn in a private situation and would choose it over a public learning environment such as a classroom.

4. Is the content of SSCMC too complex for students to learn?

Each of the nine students who were trained in the use of SSCMC, successfully demonstrated their use of the technology to the tutor at least four times. Five of the students were trained in the use of more complex SSCMC operations. These students found the training interesting and useful. They were able to complete multiple file transfers from the tutor's microcomputer to their own microcomputer. This was the most complex part in the use of SSCMC and had been taken over by the tutor after the pilot study had indicated that this would cause difficulties for the students.

Problems did arise during the SSCMC training for these students, which indicates that the longer more complex training would not have been suitable for all students. The following are examples of such problems. Equipment and software difficulties arose with the first three students during their training in the use of SSCMC. Some of these difficulties were associated with equipment and software problems. Students did not always follow the tutor's training instructions fully. At the beginning of the study, the instructions given by the tutor to the students had proven to be inadequate. When the communications software would appear not to be working, students would hit many keyboard keys and not wait for the software to react. The software stored up each of the keystrokes and then executed each one sequentially. By this time the student had become confused and had attempted to enter more keystrokes and eventually the software would lockup. The software problems and procedural problems were resolved by the tutor changing his instructions covering the communications procedure. Greater stress was placed on patience and students were informed of the actual delays being experienced in the use of the SSCMC software and how it reacted if mistakes were made in its use. The tutor was able to modify his training based on his experiences with the first few students' difficulties.

Each time a problem occurred it was reduced to a tolerable level to allow for the successful completion of a student's SSCMC training. At no time did a communication problem stop any student's SSCMC training from being completed as designed. Ongoing research was carried out, during the training, to eliminate some of the intermittent problems that seemed to occur with different students. A procedure was developed that allowed the instructor and the student to wait for messages from the software before proceeding to the next set of actions. At the beginning of the student's SSCMC training, the tutor would verbally communicate to the student the likelihood of these occurrences in SSCMC operation and the required student responses .

At the end of this training, which was as short as 15 minutes for one student and as long as one hour and 35 minutes for another, each student could use the SSCMC software fully. The SSCMC training procedure required a student to initiate a call to the instructor from the SSCMC telephone book, switch from voice to data communication, keyboard chat at the PCDOS level, keyboard chat at the SSCMC window level, or keyboard chat within the Microsoft Excel™ spreadsheet, switch back to voice communications, end the conversation and terminate the call correctly so as to drop the software communications link and continue his/her workbook exercises on the student microcomputer.

The longest training time resulted from technical difficulties and a prolonged debugging procedure with one of the first three students. This student was extremely cooperative, had already completed a large segment of the training and was interested in verifying where system problems were occurring. This troubleshooting session helped identify the possible multiple uses and users of the students' microcomputer.

Six of the nine students commented favourably on the ease of learning and using a menu driven communications package like Cosession™ during their SSCMC training.

5. Can SSCMC be used as a method of delivering SSCMC training?

Nine of ten students in this study were trained in the use of SSCMC technology through the use of SSCMC technology. Although many difficulties were experienced with this training, especially at the start of the study, SSCMC was effectively used to deliver the SSCMC training. In retrospect two factors are significant. The tutor was learning how to teach SSCMC by using SSCMC, and software and equipment problems of an intermittent nature made this task more difficult than it should have been.

At the outset of SSCMC training for a new student, the tutor requested a return to voice communications owing to a need to confirm, by a human voice response, whether SSCMC learning was occurring and being enjoyed. This was discussed by the tutor with the students. Some of the students responded with the same desire. This human voice communication desire was especially strong at the beginning of each new student's training. This need diminished for the tutor after the first six students.

6. Given access to SSCMC would students, when they needed help, initiate the interaction with the tutor?

As part of this study each student was required to contact the tutor at least four times a day. This contact was used for motivational purposes as well as to facilitate a verification of equipment operation and to ensure pacing within the course. It also allowed the tutor to verify that the student was working on the learning materials. In addition, this contact allowed the tutor to deliver prearranged training or to offer further training in the use of SSCMC software, depending upon the student's interest. Students often banked the questions that they wanted to ask the tutor and took advantage of the scheduled contact to get answers to their questions. This scheduled contact was initiated by the student. All of the students who tried to contact the tutor (nine of ten students) were able to do so on their first attempt.

If a student had a learning problem before the SSCMC training had been given, then that student was asked to contact the tutor immediately by telephone. The tutor then evaluated whether the learning problem required the use of SSCMC. If the shared screen interaction was required then the tutor guided the student to save the problem data file, before SSCMC training commenced. This was to ensure that the problem was captured for review, and to ensure that if communication stopped or equipment failure occurred during the SSCMC, they could still recover the problem situation. The same save-the-data-file procedure was also required to cover the

situation where the tutor was not immediately available and the problem had to be reviewed at a later time. The student thus could bring the problem situation up for discussion at the scheduled contact time.

Two students contacted the tutor, prior to receiving SSCMC training, with learning problems. In each situation the tutor was unable to solve the learning problem verbally. As a result, each student was given SSCMC training at the contact time and was successfully able to demonstrate its use before commencing.

One student had a problem within the first half hour of starting the course. This student unsuccessfully tried to explain the problem to the tutor verbally, over the telephone line. The tutor requested a voice to data switch to visualize the problem. The student responded positively to the tutor's request but communicated to the tutor the student's lack of knowledge in using the SSCMC software. The tutor requested the student to save the spreadsheet data file and led the student through the save-the-data-file procedure. At that point having ensured that the problem situation would not be lost, the tutor then commenced student training on the use of SSCMC. The student had already seen a demonstration, given by the student-site assistant, at the beginning of the student's training session. This meant that the student had already seen a successful visual demonstration of the operation of the SSCMC process.

This student was successfully trained in the use of SSCMC. At that point the student and tutor successfully carried out a voice to data switch procedure. This allowed the tutor to continue the student's training in and through typed keyboard chat, and demonstrate other modes of operation of the SSCMC software. The training time on SSCMC took 15 minutes. The tutor then demonstrated how the student's formula in the spreadsheet could be edited. At the end of this demonstration, the student indicated that the real problem occurred as a result of the student not being able to access this edit window. It was not that the student didn't know how to edit the formula, but rather that software was not letting the student do the edit. The tutor had obviously not

understood the problem either verbally or visually. The real problem was that the formula bar on the VGA version of Microsoft Excel™, which was being used for the training, was not being displayed. The SSCMC procedure for shared screen interaction at 2400 baud on Microsoft Excel worksheets required the CGA version of Microsoft Excel™ to be operationalized.

The 2400 baud data communication rate necessitated by the modems at either end was adequate only for CGA level screen displays. As this was the speed decided upon for the research study, the shared screen interaction of the student problem was always executed through the use of a CGA version of Microsoft Excel™. The main reason for this was the prohibitive cost of faster modems and the desire of the researcher to use standard, easily available and inexpensive equipment.

Nine of ten students were successfully trained in the use of SSCMC and a CGA version of Microsoft Excel™ to communicate a learning problem. This sounds more complicated that it was since the tutor would actually do all of the program execution and the file retrieval for the student, when an actual problem occurred.

The tutor's limited knowledge of Microsoft Excel™ did not allow him to visualize the student's problem, nor to believe that what the student was saying was an accurate description of the software operation at that point in time. This situation raised questions about the appropriate level of preparation of tutors. Tutors require comprehensive knowledge of whatever subject for which they are a tutor. The tutor can be called upon to answer questions related to any part of their comprehensive knowledge base in the subject area.

In this research the tutor's initial response must have appeared to be quite overbearing and authoritarian. The tutor at this point realized that a VGA level communication had to be attempted. This meant that the SSCMC software had to be reconfigured to allow for the VGA level of data communication. A mid stream reconfiguration is one of the most dreaded of all events in such a research study and the

tutor did it grudgingly. Would the tutor have done it if he wasn't the researcher? The easy answer is probably not.

The students normally did their training on a VGA screen display format. This was a requirement set up for the training by the host company, which wanted VGA level displays for all of the student training sessions. This was another reason why students were always requested to save their data files, before contacting the tutor. This was so that the tutor could recover or reload the saved data file under the CGA version of Microsoft Excel™.

This student learning problem arose out of the VGA system. The tutor did not want to go into a VGA communication mode for three reasons: firstly, the SSCMC software was initialized for CGA data screen communications, and secondly, the VGA screen transfer took anywhere between seven to ten minutes to effect, at 2400 baud, which was far too slow for any regular use. Thirdly, the SSCMC software would have to be reconfigured by the tutor and the student system would have to be reinitialized.

In this one instance, the tutor requested that the shared screen interaction be attempted in VGA mode, to confirm in his mind the reality of the explanation given by the student. The tutor had to see the problem with his own eyes to believe it. He had decided that most likely what the student had described was only what the student's level of knowledge allowed the student to observe. The tutor wanted to carry out similar observations, looking for the possibility of an alternative analysis available through first hand observation. The tutor changed the SSCMC setup to handle VGA screens, reinitialized the system, and with the help of the student reconnected, and commenced to visually communicate the VGA format of the Microsoft Excel™ screen.

Once the problem was communicated visually, the tutor confirmed the reality of the student's description and then did not know how to solve the problem. An alternative set of procedures was devised by the tutor, to allow the student to continue learning, while the tutor researched the problem. The SSCMC training plus the

problem solving session had lasted one hour and two minutes. The student at that time, unknown to the tutor, had elected to seek the help of a local expert in Microsoft Excel™.

The tutor researched and found the solution for the problem. The tutor then tried to reconnect to the student's machine in order to leave a message for the student. The student's modem and the SSCMC software had been set up to autoanswer, by the tutor, but this procedure failed at this crucial time. It was later discovered that the modem had been powered down and not powered up again. A receptionist for the education centre eventually answered the tutor's telephone attempt to contact the student. This telephone receptionist took a message for the student. The message detailed a procedure to reinitialize the student's microcomputer settings for the VGA version of Microsoft Excel™. The settings apparently had been changed by the previous student during his training session. He had customized the settings according to his preference for using the Microsoft Excel™ software. This further illustrated the need for a complete system initialization before a new student commenced his/her training session.

The student currently being tutored, returned after coffee break and followed the tutor's suggestions and carried on with the training until another problem arose at 3.25 p.m. of the same day. This second question was answered using voice only on the telephone. The earlier problem solution was discussed and confirmation made of its validity and execution in practice. The tutor asked this student to completely reinitialize the microcomputer and modem before the student left for the day.

After the student had gone home, the tutor tried to repeat the autoanswer procedure on the host machine. This time the procedure worked. It appeared that after the earlier VGA communications, for which the Cosession™ software had to be initialized, the system locked up in Calgary. A reboot of the system had allowed the student locally to reinitialize the machine. This apparently had allowed the student to

break the telephone connection linkage. The tutor had not been able to connect to the host machine because the modem had been turned off and left that way.

Another example of a student initiated contact covered a "not enough memory" error message that kept appearing when the student tried to work on a macro worksheet. The error message halted all exercise activities. This problem was one the tutor had seen before on his own machine and knew how to solve. The communication of the problem was verbal as was the suggested solution. The solution was effected through an unloading of the SSCMC software from memory. Later a reloading or reinitialization of the SSCMC system would have been necessary if further problems had required SSCMC to provide the shared screen interaction for problem or solution communication.

Some students chose not to contact the tutor at some of the scheduled times. This introduced uncertainty for the tutor. The tutor then chose to initiate the contact with the student. This tutor initiated contact was to remove the tutor's uncertainty of possible equipment problems that may have occurred and also to confirm that the student was still working on the course materials. The tutor then asked himself an introspective question: Would he have initiated the contact, if he was just a tutor and not a researcher as well? The tutor felt that he may not have been as concerned in that instance. All contacts whether student initiated or tutor initiated resulted in questions being asked by the student and tutor solutions being recommended. Therefore the contact was worthwhile for more than one reason, each time. If nothing else, the student knew he was being checked on, and this may have been motivational to the student.

7. What are the tutor - student relationships in a SSCMC environment?

These relationships may not vary much from a traditional tutoring environment. Many of the conversations during the telephone calls covered areas of mutual interest and the sharing of personal information. Many students expressed a desire to meet the

tutor in person. More than one student recommended that it would have been useful to have had the tutor's photograph on the materials. The invitation to have coffee was received by the tutor from some of the students.

Two students questioned the tutor on the course development and methodology of teaching and learning used for this course. Two students were interested in the college that the tutor represented. They were also interested in the other kinds of programming accessible to them. They wanted to know if the current training session could be counted towards educational certification available through the tutor's college.

Three students wanted to know if the tutor was going to be teaching or coaching and requested more information about the full function of the tutor in this environment. The tutor and the student-site assistant had agreed on what to communicate to the students, about the tutor's role. The tutor's role that was communicated was that of the trouble shooter, problem solver, coach and evaluator. Two students said that because tests were part of the course and that these tests were being marked by the tutor, this meant that the tutor was filling a more traditional teacher's role.

Two students wanted to do more work beyond what was covered in the videotape, workbook or course outline. One student was disappointed by the content knowledge of the tutor and communicated that disappointment. However, the student understood that the course outline defined the limits of the course and that the student's questions were outside those limits. When questions were asked to which the tutor didn't have answers, the tutor's response was to admit the lack of knowledge, and to research for answers to the student's questions. The students were informed of this possibility during the introductory telephone call at the beginning of the course.

In the example described above, the tutor did not successfully answer a student's question in a timely manner. The tutor felt that he had let the student down. The tutor located the student to offer his researched solution, only to find that the

student had already sought and found the answer from a local resource. In another instance, a solution to a student question was researched and communicated back to the student in a timely way. A similar possibility may not have been available in a classroom environment, owing to time, the number of students and location constraints.

One student indicated very early on that the student did not like learning in isolation or with the use of a videotape. This was a clear indication that the student's learning style may not have suited this form of distance education, and that the student knew of this situation already. Another possibility is that the student may have underestimated the amount of work involved in this study, and was not prepared for it. This student did not volunteer to take the SSCMC training. Rather the student had been sent for the training and felt that this training was taking time from more important work related activities, and that the training was interfering with the student's work schedule.

The students in this study could be grouped into the following categories:

a) those students who needed close contact and personal knowledge of the tutor;

b) those who needed the tutor to solve learning problems only; and

c) those who did not need him at all.

This final group may have felt the tutor was intruding when the tutor initiated the contact with the student, although there is no quantitative evidence to support this. However, the tutor felt that he was intruding, especially when the student did not have a question of any complexity to ask. It is possible that the student may have asked a question, just to be sociable and to appear to be cooperative.

The tutor worked with each student on an individual basis. The responsibility of contacting the tutor was left up to the student. However, in some cases the tutor felt he had to initiate the contact in order to verify that contact attempts had not been blocked

as a result of equipment problems. These contact attempts may also be ascribed to the tutor's lack of experience at tutoring.

The immediate access to help and the 100 percent solution of problems within the course curriculum, were received favourably by the students. Six students made positive comments about the fast response capabilities of the tutor in this SSCMC system. Five students remarked on the value of the quick marking turnaround time and explanation of where they lost marks. Two students remarked on the speed and ease of file transfer for their tests. They felt very positively about the burden of the file transfer being at the tutor end. Two students had enough time and interest to practice the file transfer procedure for themselves and commented on the ease of using the procedure. They felt that they could take over this procedure if they had to, although they preferred that the tutor remained responsible for the file transfer. In the case of the student who did not complete the SSCMC training, the tutor directly linked into the student's microcomputer in unattended mode and was able to transfer all of that student's completed work up to the end of the first day over to the tutor's microcomputer.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

In the previous chapter, data was presented for each of the seven research questions which guided this study. In this chapter, a concluding evaluation will be made to answer the overall research question: What was the degree of success of the learning given a situation where students were learning privately in the workplace, during company time, at their own pace, and with access to a distant tutor?

Student attitudes were highly favourable toward the use of SSCMC for assisting and tutoring independent learners and troubleshooting learning problems within the workplace. Student comments during the tutoring sessions indicated that most preferred the workplace as a training location. Participants expressed overall satisfaction with the learning experience, the materials used and tutor support given during this course. In addition, students were favourably disposed to enrolling in additional distance education courses using this form of SSCMC.

The findings of this research showed an 80 percent successful completion rate when SSCMC is used to support a distant student. Institutional intervention was facilitated through the use of support materials, the teaching-learning methods and the use of SSCMC. As Cookson (1989) stated, institutional interventions are like the "guided didactic conversations" of Holmberg whereby the institution engages in a two-way communication with students via print, multi-media, face-to-face tutorials, and counseling. "Such contacts promote study pleasure and motivation ... [and] ... favour feelings of personal relation"(Holmberg, 1983). Many of Holmberg's concepts of institutional intervention were implemented in this study and may also support the persistence statistics found in this study.

Studies confirm that adding telephone counseling and tutorials, summer school, or interactive computer conferencing to distance education courses significantly raises

the persistence and achievement outcomes of students (Persons and Catchpole, 1987; Scales, 1984, cited in Cookson, 1989). The data on completion and achievement in this study are consistent with these earlier studies. Rekkedal (cited in Cookson, 1989) reported that institutional interventions resulted in a sharp reduction of assignment turn-around time and this resulted in completion rates soaring from 69 percent to 91 percent. This research study used almost instantaneous assignment turnaround time. Students completed their assignments and submitted them electronically, the tutor marked the assignments and returned them to the student within minutes. This factor may also have contributed to the high completion rate reported in this study.

Gatz (cited in Cookson, 1989) identified the following dimensions as important in completion and attrition of students enrolled in a course of study:

(1) significance of course to goal;

(2) appropriateness of the independent method;

(3) feasibility of time;

(4) integration of interests and background; and

(5) accommodation of learning style needs.

The following aspects of this study were consistent with the findings of Gatz's work on attrition and completion. In this study, the host company was standardizing on a new software package and the employees had to be retrained (significance of course to goal). Consequently, this course was very timely. The students in this study were busy individuals who required quick upgrading, with as little inconvenience or interference with their working life as possible (feasibility of time). They needed the training as soon as they received their software packages so they could move their Lotus 1-2-3™ spreadsheets into Microsoft Excel™ format (integration of interests and background). Their training was scheduled to coincide with the first software packages arriving and being installed in the company's microcomputers. The required training could not take too long (feasibility of time).

The employees were building on previous microcomputer skills, and had an immediate interest in personal productivity on a new company wide standard product (significance of course to goal). The students were given an opportunity to learn at their own pace using a variety of exercises that covered many different work and personal interest areas (accommodation of learning style needs). Students were given the flexibility to learn using a videotape, or by using a workbook, or by using a technical manual or through the direct instruction of the tutor when learning did not occur through the other methods. The successful completion of 80 percent of the students in this study reinforces the value of Gatz (cited in Cookson, 1989) findings.

Chacon-Duque (cited in Cookson, 1989) stated that persistence was found to be enhanced by quality of instructional presentation in textbooks and study guides; variety of course media; and planned, student-centered, support. In this study, the use of a high quality videotape, and a student-centered workbook and study guide was consistent with the research findings of Chacon-Duque's study, as was the fact that students were able to select the exercise, the number of exercises and the amount of contact with the tutor. Persistence data in this study confirm a range of institutional interventions that can be successfully applied towards the improvement of learning experiences of distance education students.

Students learning on their own may face many motivational problems, as well as learning difficulties. Also, adult students face many family pressures which significantly hinder their completion rates. The completion rate for students studying at work as presented here is very high. This may be due to the nature of the subject matter under study, or it may be due to the research nature of the project and of the registrants being "on stage" (Petruk, 1975). More likely, it is due to the motivational, supportive and direct feedback models able to be implemented through this form of SSCMC. A longer study, with a larger group size is needed to confirm the data

presented here. More research is required on different subject matter courses, and different student groups in different work environments.

Ostman and Wagner (cited in Cookson, 1989) found that "lack of time" constituted the most influential single predictor of discontinuance. Consideration of these factors alongside the high completion rate for the research study, allows us to draw some conclusions. Firstly, that the course and its materials were appropriate in format, length and difficulty. Secondly, that the job didn't interfere with the learning of 80 percent of the students. The job did interfere with the students' learning in 20 percent of the cases. Thirdly, because the course took place in the workplace, there was no impact on the students persistence as a result of domestic pressures. Fourthly, the tutor's work and the turnaround time of assignments were acceptable.

Recommendations

Findings of this study suggest that SSCMC presents a viable method of problem solving for students' learning problems and the communication of solutions back to the student. Aspects of SSCMC considered for study in this very limited research clearly demonstrated that a potential learning environment exists wherein students may essentially reach the same or higher levels of achievement as those students involved in classroom instruction. It would appear from these initial findings, that SSCMC as a method of troubleshooting learning problems could have many implications not just for training individuals in the use of microcomputer software packages at a distance, but for an increasing number of correspondence courses today. Consequently, it is recommended by this researcher that serious consideration be given to a trial implementation of SSCMC in many different distance education courses.

The capability of locating the learning station on any person's desktop makes it possible for people not located near an educational institute or training facilities to have access to training opportunities. This study suggests that limited numbers of microcomputers should be upgraded and located at each workplace site where a few

employees are clustered. Such an approach could not only make regular training programs more widely available, but it could be of special benefit to the persons who want to be upgraded to the most recent technological advances in their area of speciality, without taking time off work. In the situation where an operator is in the field at a distant location, it is possible for that person to use a laptop microcomputer and modem to dial into a remote microcomputer in order to get the latest technical data or a computer simulation of operation of a fixture, or a screen share demonstration.

While development and tutoring costs are large for totally customized development of videotape and workbook learning systems, there are many ways in which these costs could be reduced. Firstly, many large and small companies are now developing reasonably priced high quality videotapes. These could be purchased and shared across the corporation and used extensively to cut down the cost per student. Secondly, workbook exercises can be developed and kept up-to-date fairly inexpensively by curriculum developers and instructional designers from local educational institutes. Thirdly, tutors may be found who can tutor a group of students learning on their own as well as carrying on with an adjusted workload in their normal place of employment.

Areas that were not fully addressed by this study but require much further research were many, and include such things as: (1) provisional registration not followed by final registration, (2) withdrawal reasons prior to intermediate or final testing, (3) failure in the final or intermediate tests, (4) the amount and type of counseling given during the course, (5) the students' age, perception, and fatigue factors, (6) the role of the tutor in attrition, (7) the nature of the adult learning process as it applies to distance education, (8) the employment of a tutor during his/her normal working day, to act as a tutor while carrying on his/her normal work activities. (9) the amount of subject matter knowledge that is required by an ideal tutor, (10) the amount of data communications knowledge or training that is required by a tutor, (11) the

amount of training required by student-site assistants. The first 3 above are academic institute considerations and typically not found in business.

Much research is required in the role of technology. For example, Bates (1988b) suggests investigating the appropriate teaching roles for different technologies. Garrison (1987) suggests that the role of technology in distance education should be researched to determine how it will assist in meeting the needs of the students in terms of equity of access, learning support, and the teacher-student interaction during the learning process.

There is very little research on the most appropriate mix of media to enhance educational delivery of different subject matter and consequently this too is an important area for future research.

While this study did not include within its scope a determination of cost feasibility of SSCMC, two of the most easily observable trends in today's society are: firstly, major reductions in equipment, software and communications costs; and secondly, cheaper, much improved and more pedagogically accurate multi-media lesson production.

Increased accessibility to educational institutes' programming is one of many key goals in distance education. There is a shift in many institutions who have accepted the challenge of addressing the changing needs of the workforce and are now implementing distance education programs which cater to the workforce.

Helm (1989) states:

> Unlike the United States, employees in Canada receive little job-related training at a distance; more frequently they travel to training sites. However, discrete professional networks do join forces to provide upgrading for their members, who may be health care professionals, teachers, lawyers or engineers. The net result is that more Canadian Institutions report offering distance-learning courses at the professional and continuing education level than at any other. (p.123).

According to Bates (1989) "In the last 15 years there has been large-scale and effective introduction of open learning and distance teaching methods throughout the world,

initially at the higher education level, but now rapidly spreading to vocational and professional training."

There are several reasons for this more recent development. Firstly, the changing nature of work. Being trained for one job for life is an untenable concept nowadays. Jobs these days require more and more continuing education. Secondly, job mobility is increasing, across national boundaries, this means traditional formats for continuing education are no longer feasible. Especially if students want to continue their studies regardless of work location. IBM estimates that over US $40 billion a year is spent by industry on continuing education (Longworth, 1987). That figure has grown exponentially during the last few years to over $100 billion. It is not surprising that distance education programs are moving into the area of continuing education and vice-versa particularly in management and technologist updating.

Through the use of today's technologies in a creative and responsible way, distance education may become a viable option for an increasing number of educational institutes and businesses, both private and public. This can lead to an increased need in SSCMC based tutor support.

SSCMC, if its feasibility can be generalized from this research study, could provide a solution to many distance education problems that is both pedagogically and economically sound.

Further considerations

This section of the study is one in which a plethora of experiences and fears endured during the set up and delivery of this training are discussed. Additionally questions that were raised by members of this thesis committee are addressed in this section. Some of these questions are listed below.

If an organization or an individual reading this research were to come to the conclusion "This is great research, and attempts should be made to duplicate it or put it into practice" what should they be advised? What are the pitfalls? What is absolutely

mandatory in terms of equipment, preparation of materials, tutor training, selection of project team members and tutor behaviour? Given the choice between a content expert and a communications expert which skill set would be most desired and why? If another person were to continue this research and be the researcher only what skill set would be required of the tutor and how would this affect the course? What subject courses could be taught using SSCMC? What courses do not lend themselves well to this process? What other technologies enhance this area of teaching and learning?

What are the pitfalls?

The first pitfall to overcome is the fear of complexity and its companion oversimplification. Fellow students and potential research partners can be counted on to make statements like "this research study is too wide in scope", "the equipment will let you down", "there is nothing new here in terms of a product", "all you are using is standard off-the-shelf technology", "you should develop something new". The fear of complexity has the effect of a medusa's gaze, it freezes the researcher(s) into inaction and creates massive uncertainty. In contrast the effect of working on a project which appears to have a "no new product" tag attached to it has the effect of making it appear simple. This oversimplification results in a loss of funding dollars, it also puts into jeopardy valuable projects which have a potential for major impacts in many different areas.

The second pitfall is that which works today will not work tommorrow. That which works in one office will not work in another office. That which works on one set of equipment will not work on another slight variation. This pitfall is guarranteed to cause many headaches. The only way to resolve it is to have individuals at both ends of the SSCMC with skills and experience in troubleshooting, a wide background in software and hardware, a solid data communications background and lastly, enough confidence in their ability in order to avoid panicking. There are endless opportunities for frustration in this arena. If the researcher's or the tutor's skill set in data

communications is weak then ensuring that the equipment functions properly may be an insurmountable task. However if there is sufficient patience and insight, data communications problems can be solved fairly easily.

The third pitfall involves multiple uses and users of test equipment. If at all possible ensure that the equipment being used is set up for exclusive use for distance education and SSCMC purposes. Multiple uses and users cause endless intermittent problems that could cause the complete breakdown of the project or course.

The fourth pitfall to avoid is the use of unique or untested software and hardware. The equipment and software should be off-the-shelf as much as possible and as widely used as possible. There is less likelihood of intermittent problems (bugs). There is a greater likelihood that this equipment and software have been thoroughly tested by many users. Also there is a greater likelihood of being able to access local expert users.

The fifth pitfall is underestimating the time required to solve problems or underestimating the level of complexity that 25 to 30 variables cause in a SSCMC environment. Estimate the amount that you think you are going to require and then multiply that estimate by a factor of 2.50. The 2.50 is a very arbitrary number but one that will save many researchers much time in the long run.

<u>What is mandatory?</u>

1. It is mandatory that whoever sets up a SSCMC supported distance education course be prepared to handle any or all of the above mentioned pitfalls. In general a team approach will ensure that sufficient resources are available to solve complex problems.
2. A local site support person is absolutely mandatory, especially at the outset of the study. Later this person can be on call for troubleshooting purposes.

3. The tutor must have data communications and microcomputer hardware and software training. There must also be prescribed procedures in place to guide the tutor in handling a large number of potential problems.
4. The tutor needs to be given training in how to behave in this environment, the data communications terminology to be used, the screen share terminology and procedures to use with interactive two way communication. In a sequential environment where only one person can talk while the other has to listen, communication protocol is well defined. The person talks and then gives an end of message signal: "over", at which point the other person generally depresses a talk button, talks and then also gives an end of message signal: "over". When both parties have finished their talking, each send the other an "over and out" message. A similar communications protocol is required for this environment. In this distance education environment many learning considerations seem to be overlooked because in the classroom they seem to be accepted as second nature to all learners. These skills being listening, communicating back and documentation. In a SSCMC environment this is not quite as straight forward as in the classroom. It is easier to not listen because there are too many technology events distract from the listening skills. This comment applies to communication from the tutor to the student as well as from the student to the tutor. In the situation of documentation, events occur so fast that it is possible to forget to record the events either electronically or manually. The word communications, has many connotations. In the world of electricity it means one thing, in the world of verbal and body language communication means something totally different. In a SSCMC environment the tutor requires a skill set from both forms of communications. A current tutor in a distance education environment may be an ideal candidate for use as a tutor in a SSCMC

environment. It would be useful to examine the change(s) in tutoring practice(s) that this tutor could document.

5. At the outset of a project for a company it is useful for the researcher to also be the tutor. The researcher - tutor role results in a certain amount of ego being involved which in turn ensures that the tutor motivates the students to complete their studies. Would tutors who were not the researcher also experience similar desires to be proactive as a moderator? The most successful tutors are those that are proactive and proactive moderators are at the base of successful distance education courses. This area needs much further research.
6. The learning materials that are used for this kind of a project need to be carefully chosen and most importantly must complement each other. The apparent success of this experiment was strongly reliant upon the quality of the video that was produced by Microsoft Corporation as well as the workbook of exercises and self tests produced by the researcher. Had either of these products been poorly put together or illogically sequenced then student completion rates would have suffered. The researcher in developing the workbook took into consideration many of the ideas and important developments in the area of computer assisted instruction at the Apple Innovations Support Centre, Unversity of Alberta.
7. Distance education tutors and developers of distance education programs need training in media selection (Heidt, 1978; Hezel, 1987; Knowles, 1986; Kressel, 1986; Mayor, Daussand, Dirr, 1986; Meierhenry, 1986; cited in Lane, 1989).
8. Some students' learning styles do not lend themselves well to the individual or private learning which is a characteristic of distance education. It is important to recognize this and ensure that alternative media and methods exist to address the needs of these individuals.

9. It is important that the equipment used for delivering be well tested and standardized for all locations. If this is not done then considerable problems will arise. These problems distract both the student and the tutor from the learning tasks and can result in a failure of the course.

What subjects do not lend themselves well to a SSCMC environment?

There are many subjects that require visual clues and physical presence of both the teacher and the student and others that require group dynamics as a core process to the process of learning. These subjects do not lend themselves easily to distance education supported by SSCMC for troubleshooting or instruction. These is a need for extensive research to determine subject areas where SSCMC may or may not be used. Equipment already exists that can transport compressed video along with data and voice on one line: the Integrated Services Digital Network (ISDN). Others have already developed "voice over data" devices that use the standard telephone network. These devices could allow two individuals at a distance to carry on a voice conversation concurrently with a SSCMC session. These kinds of devices and networks could greatly enhance a SSCMC session. Videoconferencing networks could quite easily enhance the initial set up of distance education programs supported by SSCMC. The occassional session using videoconference facilities could help to overcome isolation and facilitate group dynamics.

What are the barriers to widespread implementation?

At present there are no set guidelines on how to set up a successful SSCMC mechanism to support distant students. There is no prescription, no specifications on equipment, no recipe for success. These guidelines have to be developed. Each organization that intends to use SSCMC to support their employees has to develop both procedures and policies that limit the number of variables that could otherwise exist. Too there is a fear of the technology as well as a fear of failure. Employees charged with implementation of such a program in their company may be concerned

with the number of variables that could cause distaster. They may feel that the risk is too high. Are the rewards sufficient to overcome this fear? In many companies the obvious rewards may not be discernable. A cost benefit analysis of setting up an in house training station needs to be detailed and communicated out to different companies.

Employees also fear that they may not possess the necessary skills to troubleshoot problems if they occur. The troubleshooting skills that a person possesses are equivalent to that person's familiarity with the instrument or procedure. The more experienced a person is with the instrument, the more that person is able to troubleshoot related problems. There are many pitfalls but not enough to warrant companies giving up the considerable benefits of such an operation. These considerable benefits include less time away from work, lower travel cost, lower fees, lower expense claims, greater and more timely access, more customization to the student's learning style, greater comfort, greater flexibility, greater likelihood of success, more private, more personalized, perhaps even longer term retention.

There are many ways to overcome some of these initial fears. An experienced individual could help companies through the initial start up phase, or a general trouble line (an 800 number) could be set up, cheaper distance line networks like datapac could be used to help remote learners. The technology and knowledge exist to enhance education opportunities for the remote student as well as the clustered working individual.

The many technologies which can enhance this area of distance education are primarily based on computers, film and telecommunications. Examples of such technologies are cable television, fibre optics, microwave, slow scan television (freeze frame video), satellites, videoconferencing, audioconferencing, microcomputer audiographic teleteaching.(Barker, Frisbie & Patrick, 1989). Two way voice link and two video link giving full motion is the highest form of interaction and the most

expensive available in distance education. An interactive linkage between students and teachers as facilitated by videoconferencing or the equally live linkage facilitated by SSCMC permit a response to student enquiries much like the traditional classroom setting. Students can seek on-the-spot clarification by the tutor. In the past any form of video or film linkage required microwave, dedicated linkages, fiber optics or satellites today however SSCMC can do the same over standard home level telephone service. With faster and cheaper modems the volume of data that can be transported will improve dramatically as will the features, form and value of SSCMC systems.

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APPENDIX A

Characteristics of the Cosession™ SSCMC Software Package.

Characteristics of the Cosession™ SSCMC Software Package.

- It was easy to use, and menu driven.
- It allowed for communication using a normal telephone call (voice first), and then facilitated a data transfer capability without requiring a redialled telephone connection.
- It allowed individuals to interactively move between typed keyboard chat and voice chat, back and forth as many times as required.
- It allowed easy access to an online help.
- It allowed, at the student's or tutor's convenience, a common session to be recorded, and later allowed that common session to be played back like a videotape.
- It had fast accurate data transfer rates.
- It allowed for unattended access, so that the microcomputer could be left powered on, and the tutor or the student could then access the other's machine, without a physical presence of either the tutor or student required for connection and communication.
- It allowed files to be transferred between machines in foreground or background memory mode.
- It allowed for an automatic scheduling of file and message transfer.
- It allowed printing at a local or remote location.
- It allowed suspension of operations to run another program or carry out other activities, and return later to resume operations.
- It allowed remote access and control of another microcomputer.
- It allowed individuals the ability to keep a data file for a billing log.

•It allowed multiple file functions such as display, delete, rename, list, and transfer files. All these file operations were able to use the standard wild card characters common to today's microcomputers, such as: '*', '?'.

•It had a phone book directory that allowed access to any entry by either the name of the person desired for contact or directly by his or her phone number. It was a database to which names and telephone numbers could be added, changed and password protected, with a default setting for a quick, easy connection to the most used entry.

•It allowed auto-reboot from a remote location.

•It allowed easy handling of multiple baud rates in a flexible continuous manner.

•It allowed one student to communicate to another without going through some central unit.

•It was activated easily and quickly (for example with the use of a 'hot key').

•It allowed password protection at a microcomputer access level and also at each directory and individual file level.

•It allowed dial back to facilitate reverse charges for long distance telecommunications.

•It allowed automatic redial on receiving a telephone-line-busy signal.

•It allowed easy menu driven access to any modem or communication port.

•It allowed access to most popular local area networks and any microcomputer on that network.

•It allowed connection to different mainframes.

•It was compatible with many configurations of popular equipment.

•It allowed for remote keyboard enable/disable to completely control a remote microcomputer.

- It allowed for data encryption to avoid data interception and copying during the distant communication.
- It allowed for multiple terminal emulations (again for mainframe access). And finally,
- It allowed for command line, and run time system configuration changes, without requiring the distant microcomputer to be reintialized, so that the SSCMC software setup could be customized from a distance by a remote tutor.

APPENDIX B

Definition of Terms

Definition of Terms

Asynchronous. Two way data communication of a stop and start nature. Similar to a two way radio which requires an end of message signal to let the other individual commence his/her communication.

Auto-reboot. To remotely reinitialize a microcomputer. That is the reloading of the disk operating system from permanent memory, such as a hard disk or diskette, into temporary random access memory (RAM) of the microcomputer.

Background Communications. The transfer of files in the background, while another software package is running in foreground memory. You can update remote microcomputers without interrupting foreground activity.

Baud/ Baud Rate. This is the term used in data communications for the transfer rate of data. It is usually measured in bits per second. Any character in the alphabet usually requires 8 bits to represent it in digital form.

Billing Log. A microcomputer data file on which you can track all telephone connections identifying who called, when they called and the elapsed connect time of a call.

Bulletin Board. An electronic 'blackboard' on which messages can be left by many people for one or many other persons, in a public manner. It is one form of an electronic messaging system.

CO/SESSION™. A SSCMC software package (program) written by Triton Technologies that allows two people, in different locations, each with a personal computer, simultaneous control of one personal computer designated as the host. A major feature is that it allows switching from voice to data linkage interactively during one uninterrupted telephone call.

Command Line or Menu Driven. Commands controlling the set up and use of CO/SESSION™ can be used from a command prompt line or from a menu selection on the microcomputer screen.

Comm Port Window. This window is a menu on the microcomputer screen, that facilitates selectable access to any modem or communication port on the microcomputer. A menu item once selected, can remain as the default setting for dialled telephone connections.

Data Compression. All data, including screen updates and file transfers, are compressed for speed.

Data Encryption. All communications are encrypted to prevent eavesdropping, undesired access or illegal copying.

Dial Back. Allow the remote to call the host and have the host call the remote back automatically. This provides added security and allows you to reverse phone charges. Additional features such as password protection exist to facilitate this in unattended mode.

Digital Data. Alphabetic, numeric and symbolic data can be represented by the use of a binary system (two digit system), that is in 1's (ones) and 0's (zeros) and stored in that form.

Direct Connection. This allows you to connect two machines through their serial ports using a null modem cable.

Disk Operating System(DOS). A software package (program) developed by Microsoft™ Corporation for both IBM™ and IBM™ compatible personal computer systems, that allows control of the personal computer, its devices such as hard and floppy drives, and permanent storage media such as disks and diskettes.

File Functions. This is a feature of CO/SESSION™ which allows you to transfer, display or delete files on either the remote or host microcomputer. Use of wildcard characters are allowed to transfer entire directories with one command.

File Security. To restrict the ability of a person, that has access to your microcomputer, to transfer, display or delete files on the remote microcomputer by file, directory or system.

Floppy Diskettes and Hard Disks. A permanent storage medium using electronically magnetizable film on plastic and aluminum base disks respectively.

Graphics and Color Support. A feature of Cosession™ which allows the software to support text, color or interactive graphics including the latest vector graphics adapter (VGA) standards.

Host. The term used in SSCMC where the applications software package resides. In this study that is the student's location or student's system site or student's microcomputer.

Hot Key. A single keyboard key that has a set of programmed instructions assigned to it. These instructions are executed when the key is depressed. Two keys may be programmed as the 'hot key' combination to reduce the likelihood of accident execution of instructions. These two keys must be activated simultaneously.

IBM™. The trademark of International Business Machines Corporation.

Local or Remote Printing. The ability to direct or route a print job to the host or remote microcomputer.

Mainframe and Mini Terminals Emulation. A support feature of Cosession™ which allows IBM 5250™ and IBM 3270™ terminals emulation. Cosession™ also emulates IRMA™, AST™, IDEAcomm™, and SmartAlec™ communication boards.

Memory Resident. This describes a feature of some software packages to stay in a segment of memory specified for 'stay memory resident' programs. These programs are often utility programs and stay in memory while other applications programs are being loaded, unloaded, or worked with. The memory resident programs can be executed by one single keystroke or 'hot key' combination. These programs can often be unloaded from memory, to free up more memory for applications programs,

without rebooting the microcomputer. It is a feature of Cosession™ which allows it to instantly make or receive communications connections.

Microcomputer. The same as personal computer.

Microsoft™ Corporation (MS). A limited liability company, that has developed software packages for the IBM and Apple MacIntosh personal computers.

Microsoft Excel™. A spreadsheet, graphics and database software package developed by the Microsoft Corporation for the IBM and Apple MacIntosh personal computers.

Modem Support. Flexibly use a wide range of settings for many of the popular modems especially Hayes compatible modems from 300 baud to 19.2 kilobaud.

Multimedia Delivery. The use of print (texts and workbooks), videotapes, videodisks, computers, software packages, and audio technology to deliver subject matter.

Multiple Baud Rates. This is a feature of Cosession™ that allows the software to automatically cycle to the correct baud rate of the received connection request.

Null Modem. This is device where pins 2 and 3 are cross connected on standard termination connectors (specified as female and male) based on the RS232C standard recognized for data communications.

Null Modem Cable. This is a RS232C standard cable where wires 2 and 3 are cross connected on the standard RS232C termination connectors.

On-Line Configuration Changes. This is a feature of Cosession™ that allows adjustments to the host's configuration settings instantly by the remote or vice versa.

Password Protection. The assignment of unique individual or group passwords and logins for each user.

Personal Computer(PC). A microcomputer that is for the use of one individual person at any one moment in time.

Phone Directory. This is a telephone book directory in which names, telephone numbers, system or file passwords and communictions settings are stored for all individual's with whom connections are often made. Through the phone book directory an individual can establish a communications connection by the use of the a specified person's name or phone number.

Protocol. A set of rules specified for the different levels of data communications. It covers rules governing hardware specification, handshaking signals and high level (software) language communication.

Quick Connect. This feature of Cosession™ allows the host and remote to establish a connection to each other through the use of one keystroke or 'hot key'.

Random Access Memory (RAM). Temporary central memory in a microcomputer, measured in megabytes (MB) or kilobytes (KB).

Remote. This is term used in SSCMC for the tutor's location or tutor's system site or tutor's PC.

Remote Keyboard Enable/Disable. This allows a tutor to disable the remote student keyboard to prevent unauthorized use. This is useful to stop interference while trying to demonstrate a model or exercise on the student's machine.

Screen. This is the same as a Television (TV) screen, Cathode Ray Tube (CRT), Visual Display Unit (VDU), Monitor or Computer Monitor.

Screen Share Computer-Mediated Communications (SSCMC). SSCMC refers to real-time screen share interactivity between two individuals separated by space via telephone lines, personal computers, modems and a computer conferencing software package. In SSCMC one of the two personal computers is the host computer while the other is the remote computer. The tutor is at the remote computer, because the software or application package, on which the training occurs, usually resides on the host or student system.

Screen Updates. This is the reception and redisplay of a full screen of data from a distant unit. The speed at which this occurs varies according to the capacity of the modem used, the setting of the baud rate, and the screen refresh rate setting in the communications software.

Session Recording. To record and playback screen images or the entire session between the host and the remote.

Suspend. This a feature of Cosession™ that allows you to access DOS on your PC while maintaining the remote PC connection.

Synchronous Communications. Data communication occurring at the same rate at the same time.

Terminal Emulation. This is the ability of a software package to allow the microcomputer to emulate (act as) another machine. For example as a teletype (TTY) terminal in order to access a database or bulletin board service.

Tutor Log. A book or file in which the tutor writes detail notes on the interaction with the student.

Tutor (noun). A subject matter specialist who answers student questions regarding course content or student difficulties in learning, provides socialization opportunities, carries out individualized instruction, and evaluates the student (when required).

Tutor (verb). This is to provide guidance, information, assistance, motivation, encouragement and evaluation to students assigned to the tutor (noun).

Two-Way Synchronous Communications. Simultaneous data transfer between two people or personal computers.

Unattended Mode. The computer is powered up and the SSCMC software is loaded and is resident in temporary memory. The ready-to-receive a telephone call status is initiated through the SSCMC software and the modem, and the microcomputer is left physically unattended but available for remote access.

UNISYS Corporation. A computer manufacturer of mainframe computers and MSDOS™ compatible microcomputers.

Vector Graphics Adapter (VGA). One of the standards in the display of characters on the microcomputer screen. This is a microcomputer interface board that generates a computer screen which is 8 times the clarity of a standard color graphics adapter screen.

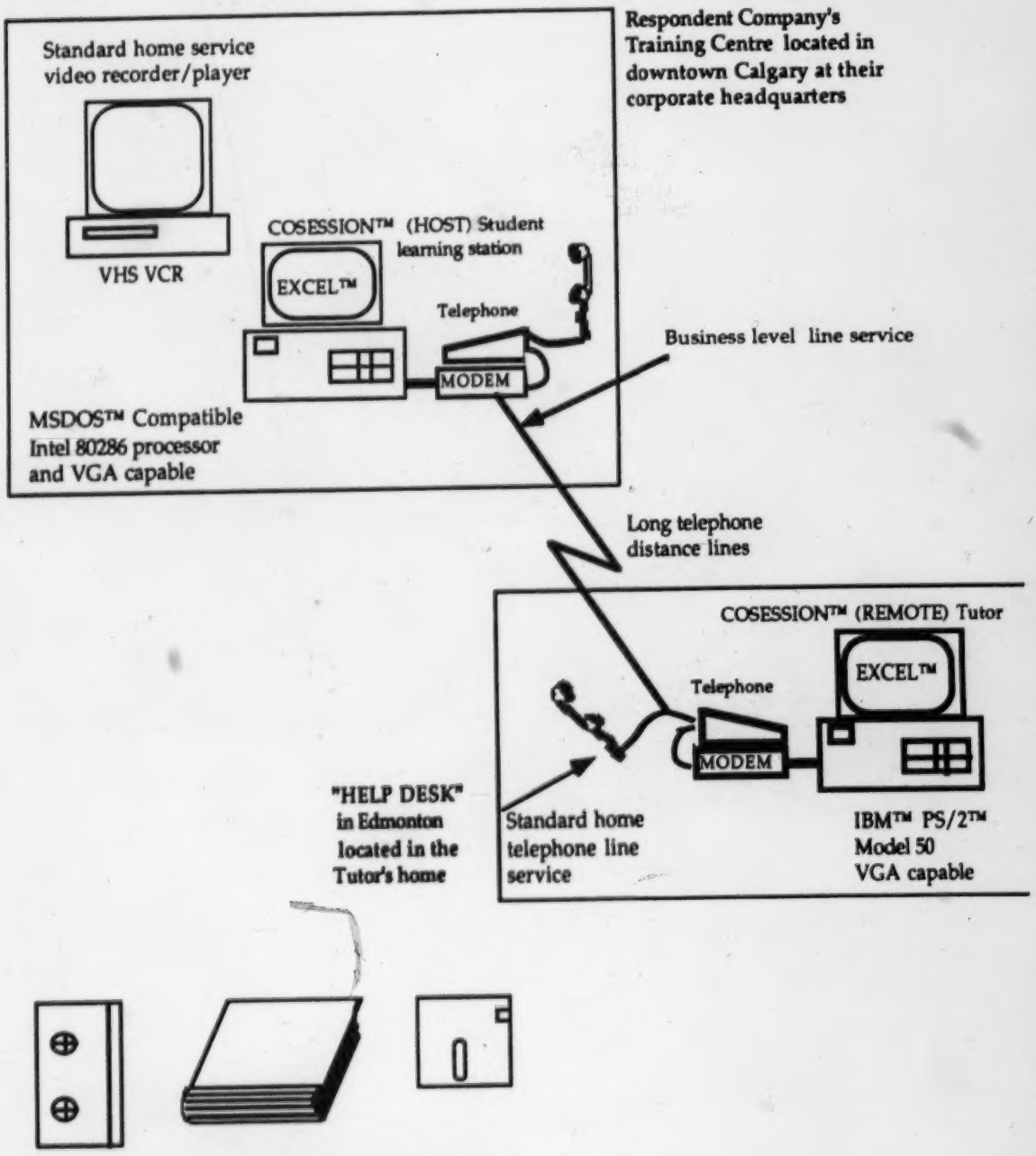
Xmodem File Transfer. This is a feature of Cosession™ which allows files to be transferred or received using the Xmodem protocol.

APPENDIX C

Equipment used for SSCMC

Computer-mediated Communications

Equipment


Standard home service video recorder/player
VHS VCR
COSESSION™ (HOST) Student learning station
EXCEL™
Telephone
MODEM
MSDOS™ Compatible Intel 80286 processor and VGA capable
Respondent Company's Training Centre located in downtown Calgary at their corporate headquarters
Business level line service
Long telephone distance lines
COSESSION™ (REMOTE) Tutor
EXCEL™
Telephone
MODEM
"HELP DESK" in Edmonton located in the Tutor's home
Standard home telephone line service
IBM™ PS/2™ Model 50 VGA capable

Videotape, workbook and diskette containing a copy of COSESSION™ communications software for screen sharing and voice to data switchable communications.

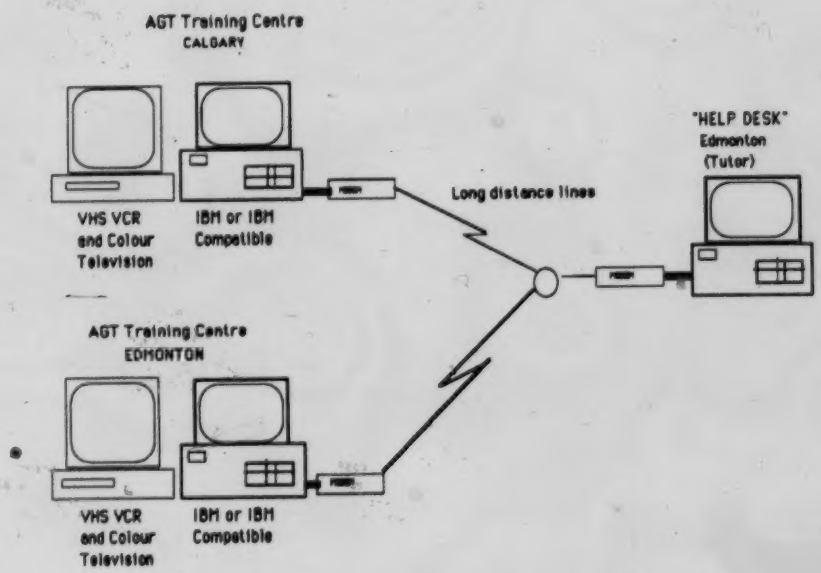
Figure 1

APPENDIX D

Poster used to solicit students.

MS-EXCEL BULLETIN

DISTANCE EDUCATION



Introduction to MicroSoft Excel using
Computer Conferencing and tutor support

Course Outline overleaf

To register for the course or to get more information on the course, contact Cameron Mitch
at (403) 231 - 8866 or Jim Richardson at (403) 530 - 5717

TAKE A PERSONAL DEVELOPMENT COURSE AT YOUR OWN TIME AND CONVENIENCE. AT YOUR OWN PACE AND YOU CAN ADJUST THE AMOUNT OF LEARNING TO YOUR NEEDS. YOU CAN GET HELP WHEN YOU EXPERIENCE ANY LEARNING DIFFICULTIES, INSTANTLY.

AGT, NAIT, UNIVERSITY OF ALBERTA COOPERATIVE PROJECT

Introduction to Microsoft Excel

Course Outline

The subject outline below details what is covered by the video based system from Microsoft corporation. The distance education workbook, exercises, instructions for completing exercises and tests are designed to interact with the Microsoft Learning System

Getting Started

1. MicroSoft Excel for the P.C.
2. Files and file types in Excel
3. Data and data types
4. Windows and the windows interface
5. The mouse and its operation
6. The use of excel without a mouse interface
7. The keyboard and the key assignments

MicroSoft Excel Basics

A. Basic Basics

1. The Worksheet, Menus and Bars
2. Cursor, keys and movement of cellpointer
3. Typing and Entering text data, Editing
4. Numberic keypad, data entry and a simple formula.
5. Saving data files, dialog boxes and naming files.
6. 3 exercise worksheets and a test worksheet

B. More Formulas

1. Retrieving data files (Opening existing worksheet files)
2. Copying formulas, Relative and Absolute referencing
3. More editting, cutting, pasting and Formatting numbers
4. Columns and rows functions and aligning text
5. Saving a file and printing
6. 3 exercise worksheets and a test worksheet

C. Functions, Names

1. Functions: Sum, Average and order of calculation
2. Creating and using Names for cells
4. Creating and using Notes
5. Using the IF function
6. 3 exercise worksheets and a test worksheet

D. Fonts, Columns and Rows, Ranges

1. Titles, Inserting rows, Adjusting Row heights
2. Formatting Fonts and Repeating an action
3. Modifying font choices and Hiding a column
4. Combining ranges and shading
5. 3 exercise worksheets and a test worksheet

E. Linking worksheets

1. Linking two worksheet
2. Testing the linkage
3. Saving the files and opening the saved file
4. 1 exercise in linking worksheets and a test worksheet

F. Creating and modifying charts

1. Switching windows, moving and sizing windows
2. Creating a chart, Adding legends
3. Changing the chart type, Adding a title and Printing charts
4. Selecting chart elements and Closing all files
5. 1 exercise in charting worksheets and a test worksheet

Dear Participant,

Your Help is needed to conduct a study about an area of interest in distance education: self guided learning and tutoring via computer conferencing.

I have taught computer hardware and software courses to industry for 10 years. As a result of my experiences, in training in the workplace, I decided that an interesting study for a Master's thesis would be to determine if individuals can learn effectively by themselves, using videotapes, workbooks and access to a tutor via computer conference. This project is under the direction of Dr. Milton Petruk, Division of Educational Research Services, University of Alberta.

I am looking for employees of AGT who would be interested in learning MicroSoft Excel, using a videotape instruction package, a microcomputer, a specially designed exercise/ test workbook and computer conferencing. This method would include scheduled attendance at a learning station at your work location, for approximately 6-7 hours per day over a two day period.

Your participation will involve:

1. A 30 minute demographics questionnaire.
2. Completion of the above course within two days.
3. The maintenance of a personal log detailing learning accomplishments and difficulties.
4. The completion and submission of four tests.
5. A 45 minute post course questionnaire gathering.

Participation in this study will give you the opportunity to realize the progress you make with these skills as a result of this process. Hopefully, the results will determine which instructional method is most suitable for teaching the skill.

Participation in this study is voluntary and participants will remain anonymous in the results. It will not be possible to identify any individual or department in the results. The information will be strictly confidential.

I hope that you will consider helping me with this project and will contact Cameron Mitchell to register for the course.

Yours Truly,

Kawal Dhariwal, B.A.B.S., CDP.

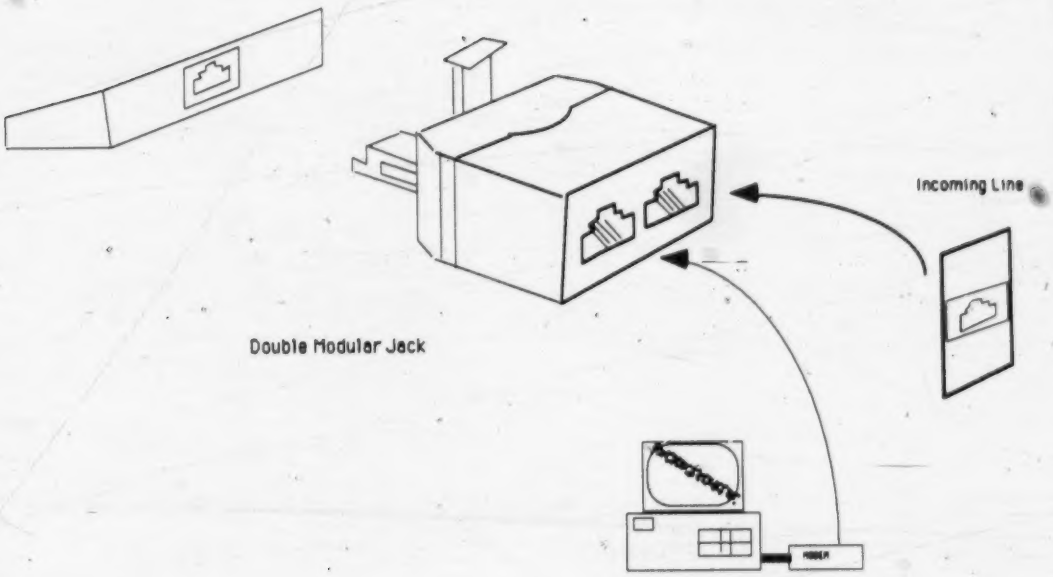
AGT, NAIT, UNIVERSITY OF ALBERTA COOPERATIVE PROJECT

APPENDIX E

A parallel line switch linking the telephone to the modem and microcomputer.

This is the connection format to be used when connecting a microcomputer to a computerized telephone systems allowing multiple selection of lines.

Computerizedd telephone system



This duplex jack will allow us to connect to a telephone handset connected to a computerized line switching system. We have to manually select a line before we can dial out using the communications software or manually.

APPENDIX F

Initial Cosession™ settings for the student site microcomputer

THE APPLICATION (HOST) STUDENT SITE SET UP PROCEDURE

After you have followed the installation procedure for Co/sessions, you should run the configuration program as follows:

C:\ >CD \SESSION <ENTER>
C:\SESSION >SCONFIG <ENTER>

This will bring up a menu of options that need to be configured correctly so that the tutor(remote) and the student (host) units are communicating correctly. The configuration menu choices should be set up as follows:

A. Main menu hot keys .....<Alt><LeftShift>
B. Auto Answer on Loading.....NO
C. KB/Screen Error Correction.....NO
D. Unattended Access.....YES
E. Eliminate Screen Snow.....YES
F. Menu Fill Color.....BLACK
G. Menu Background Color.....BLUE
H. Menu Foreground Color.....WHITE
I. Input Background Color.....WHITE
J. Input Foreground Color.....RED
K. Sound.....ON
L. Quick Connect Name..... Leave Blank
M. Password Protection..... NO
N. Reboot on SUPPORT Hangup.....NEVER
O. Notification Popups.....OFF
P. Special Keyboard Handling.....YES
Q. Special Console Driver.....YES
R. Time Display.....OFF
S. Screen Length.....25
T. Fast Graphics.....NO
U. Directory Access.....Leave Blank
V. Video Mode Synchronize.....OFF
W. Full Speed mode.....NO
X. Blank Screen/KB on connect.....NO
Y. Answer on ring count.....03
Z. Screen Check scan rate.....04

APPENDIX G

Guidelines for student contact with the tutor

Co-sessions student handout.

The Co-sessions software should have already been installed and properly initialized on your machine by technical support personnel. You should now be ready to make your call.

A. Making a call

1. If you are not at the Co/session Main Menu then press the following keys simulataneously :
<ALT> <LeftShift>
2. Press <F2> to display the Call Menu
3. Press <F1> to Call. Co/session will dial the tutor's phone number in the default setting.

B. Quick Connect (a faster alternative to the above)

1. If you are not at the Co/session Main Menu then press the following keys simulataneously :
<ALT> <LeftShift>
2. Pressing <F1> will prompt you with the telephone number setup under the DEFAULT phone book entry, press <ENTER> to dial this number. You can change the number by backspacing and typing in a new number.

C. Keyboard Chat

This function allows you to have an interactive keyboard conversation with another Co/session user. To use this function you must have a Co/session connection established. The mode at the top of your menu screen must be ACTIVE or SUSPENDED.

1. Press <F5> to display the double window (as shown below) on both the Host and remote screen.

2. Type in your message, it will appear in the top window. The distant tutor will see your message. When the distant tutor types in a response you will see this in the bottom window.

3. The windows hold six lines of text. To clear a chat window press <F1>

4. To end keyboard chat press <F10>

D. Hang up

To break the Co/session connection, press <F6>

Telephone conversation first with the Distant tutor (remote), before switching to screen sharing via data communications.

1. Telephone the Distant tutor using 1-463-0372 during the month of May
and 1-437-3823 during the month of June.
2. If you are not at the Co/session Main Menu then press the following keys simulataneously :
<ALT> <LeftShift>, wait until the tutor has done the same.
3. Presss <F7>. When the prompt appears "Do you wish to remain the Remote?", respond with a "N" for no. You want to remain the host.
4. Hang up the telephone when the modems have connected.
5. Carry on the conversation using Keyboard chat, Press <F5>.

Switching data-to-voice.

1. During the Co/session connection either the Remote(Distant tutor), or the Host (you the learner), can request switching to voice connection.

2. If you press the <F7> key you will get the following message:

One moment please while the remote is being informed

3. The Tutor will see the message:

The Remote User Wishes To Go To Voice Mode!
Accept The Voice Mode Request (Y/N)?

4. If the tutor accepts, you will be prompted on your computer screen to pick up the telephone and "Press any key" to begin voice mode.

Switching voice-to-data after having switched data-to-voice.

1. When the remote(tutor) and you the student(host) are in a telephone conversation, you both have to press the <F7> key. The following message will appear on your screen:

> **To return to a data mode, both users must switch at the same time. Press anykey to switch to data. Press <Esc> to stay in voice mode.**

2. Press any key. "Note: timing is crucial here for success". Listen to your telephone for the modem tones. You will get a notification message if the connection was successful. If the connection was not made, go to the top of this page to follow the procedure written there.

Daily signon procedure and submitting test files for evaluation

Daily Signon procedure

1. Each learner who attends a scheduled session must telephone the tutor using the computer conferencing software, CO/SESSIONS, to indicate that they are :

    1. In attendance,
    2. Able to contact the tutor and confirm that the tutor is available.
    3. Able to remember how to use the screen sharing software,
    4. Capable of following the procedure to submit a test to the distant tutor.
    5. Know that if problems exists, they have access to help at their convenience.

2. The Edmonton learners will contact the distant tutor at 15 minutes after the hour, at the beginning of their sheduled learning slot. The Calgary learners will contact the distant tutor on the hour 8.00 a.m or 9.00 a.m. etc. also at the beginning of their scheduled learning slot. All users will contact the tutor to signout from the learning station. This signout is required for lunch time, and day end, but not coffee breaks other short breaks.

3. If the telephone is busy when the initial contact attempt is made, the learner should wait for 2 minutes and then attempt to call again.

4. The learner should manually dial and contact the tutor using voice connection first always.

Sumitting of test files.

The tutor will access these directly from the xldata directory and return marked tests to that directly.

APPENDIX H

Self-Learning Pre-course Questionnaire

Self-LearningPre-course Questionnaire

Please answer the following questions by checking the appropriate space (s), or writing in the answers which provide the correct information about you. **Information on this form is kept strictly confidential and is only available to the researcher.**

Do Not Write in This Area

Part I. Demographic

A. Student Id._____(1-3)

B. What is your present position ?

1. Management ___
2. Supervisor ___
3. Technical ___
4. Clerical ___
5. Other (Specify) _____

4

C. What is your area of speciality ?

1. Telecommunications ___
2. Accounting ___
3. Engineering ___
4. Education ___
5. Secretarial/Clerical ___
6. Other (Specify) _____

5

D. Number of Years employed at AGT: count part of a year as one, i.e., anything over 1 year is counted as 2, and over 5 is 6.

1. 1 year and less ___
2. 2-5 years ___
3. 6-10 years ___
4. 11-15 years ___
5. 16-20 years ___
6. Over 20 years ___

6

E. What is your age in years?

1. Under 25 ___
2. 25-29 ___
3. 30-34 ___
4. 35-39 ___
5. 40-44 ___
6. 45-49 ___
7. 50 or over ___

7

F. Gender? F___ 8
M___

Part II. Academic

A. Educational Background (School, College, University)

1. Masters Degree ___ 9
Faculty _____ 10
Year of graduation _____ 11

2. Bachelors Degree ___ 12
Faculty _____ 13
Year of graduation ___ 14

3. Diploma ___ 15
Faculty _____ 16
Year of graduation ___ 17

4. Other (Specify)_____ 18
Area(s) of study _____ 19
Certificate _____ 20

5. Grade 12 ___ 21
Year of graduation ___ 22

B. Have you ever previously taken any Computer course(s) in:
(Check all relevant courses)

1. Introduction to Microcomputers ___ 24
2. Introduction to Disk Operating System (DOS) ___ 25
3. Introduction to Lotus 1-2-3 ___ 26
4. Introduction to Excel ___ 27
5. Introduction to Database (Data Ease or dBase) ___ 28
6. Introduction to Wordprocessing (any kind) ___ 29
7. Data Communications ___ 30
8. Local Area Networks ___ 31
9. Other(Please specify, use the area below, if necessary) _____ 32

_____

_____

Part III: General and Attitude

A. Have you ever taken any videoconferencing courses? (Y/N) ___ 36

If the answer was yes, how did you feel about the program?

1. Enjoyed it a lot, it was useful and productive ___
2. Enjoyed it, it was good. ___
3. Neither liked it nor disliked it. ___ 37
4. Disliked it, poor way to learn. ___
5. Disliked it a lot, found it wasted my time. ___

B. Have you ever used electronic mail? (Y/N)___ 38

If yes, what kind?

1. PROFS (IBM mainframe) ___ 39
2. Bulletin Board (any) ___ 40
3. Other (Specify) _____ 41

C. Have you ever taken a correspondence course? (Y/N) ___ 44

If the answer was yes, how did you feel about the program?

1. Enjoyed it a lot, it was useful and productive ___
2. Enjoyed it, it was good. ___
3. Neither liked it nor disliked it. ___ 45
4. Disliked it, poor way to learn. ___
5. Disliked it a lot, found it wasted my time. ___

D. I am taking this course because? (more than one reason may be chosen)

1. I want to learn about Microsoft Excel ___ 46
2. I want to improve my skills on spreadsheets ___ 47
3. I am expected to learn this new package ___ 48
4. I am interested in getting a certificate for this course. ___ 49
5. I want to learn about computer conferencing ___ 50
6. I like to learn on my own, at my own pace ___ 51
7. Other (Specify)_____ 52

APPENDIX J

Tutor Log

Tutor Log

Date	Time	Reason for Contact	Success/Failure
June11		New Student.	
	8.45am	Spoke to Cam, tested out equipment. Signals line faulty... Voice connection to data switch unsuccessful Asked Cam to check equipment . Let's re-initialize everything, modem powered down and repowered. Push in the RS232 connectors and wires. Check phone line link, push in the connectors. Let's try again.. Voice to data switch requested through Cosession™. It didn't work!! I suggested that we unload Cosession™, using the Sunload command and reload it into memory. Cam did this. Now let's try again.. It worked. I should have powered down the microcomputer also at the beginning. Noise on the line... I'm gett. g funny characters on my screen, looks to me like a bad connection. Should I retry.. It seems acceptable. Let's carry on. Oops! shouldn't have done that. "Bad block memory error" on Cosession™ everything has hung up. I switched my modem off, line is still connected. I couldn't hang up. Line is still connected at Cam's end.	
	9.00am	Eventually Cosession™ released the line. I suggested to Cam that it was probably a noisy line problem and that we shouldn't waste any time on it right now. I wanted Roger to start his workshop. I suggested that we could check this problem out later. Cam agreed.	
	9.10am	I talked to Roger, explained the sign in and out requirement, the need for patience, the voice first procedure and what to do in case of problems. That is, always save the problem file. Booked training time for next day. Told him that I didn't expect any problems and that this mornings problems arose from a noisy telephone line and a bad connection. He seemed comfortable with the explanation.	
	9.17am	Roger started the videotape.	
	11.45am	Roger called. He had finished section A. Went a little advanced on to Test A. Copying formulas and absolute referencing. He did this on his own volition. All ok. Normal check in. Telephone call only.	

3.20pm Roger called. He is on Test B. He is having trouble changing fonts. I talked him through the Cosession™ voice to data switch procedure. We connected sucessfully. I then ran the CGA version of Excel, showed him how to change the font in Excel. He seemed pleased with the interaction capability and visual show and tell. We signed off, I keyboard chatted him through the sign off procedure.

3.28pm He wanted to format just a single cell and not the whole worksheet. He wanted to format a single cell, and was unable to. Problem with the instructions either in the video or in my exercise workbook. Telephone (voice) solution only was required.

June 12

8.45am Roger called to sign in.
He had a few questions. How and why do you hide columns. Roger had viewed the videotape up to section C and hadn't seen the hiding a column procedure on the videotape. I explained to him how to do this. We chose to do this in screen share mode as it was just as easy that way as it was to do a voice-connection-only description. I showed him how to hide and unhide.
We switched to voice connection to ease the communication. It was getting slow using only keyboard chat.
I explained the course outline to reestablish where the exercises fit in with the vidoetape.
I explained why the first exercise always was easier and covered earlier material in other parts of the course (reinforcement and comfort zoning)
We established that the next contact time would be 11.45am.
I indicated that I would do a file transfer of his completed work later in the day.

9.45am Roger called. Problem with formula creation.
We went into Cosession link because I had trouble identifying his problem. What he was saying seemed to be a correct procedure. We went into keyboard chat, when I exitted keyboard chat, the MsExcel spreadsheet came back straight away, without the normal redrawing as it was normal for it to do. Although I felt this new operation was the way it should have normally operated. Now I had no control of my keyboard. Something was wrong. So I requested keyboard chat. The keyboard chat window came up again. I explained to Roger that we were experiencing some problems and that this might take a few minutes. He asked me what he had to do. I said be patient and if we lose contact he should redial me. When I went back out of keyboard chat the Excel screen painted normally and I had regained full control.

I told Roger all was well at the Excel spreadsheet level and then I loaded Roger's problem file. The problem was not straight forward. I looked at his formula and everything appeared to be normal. It was after a few minutes of trying numerous tests that I noticed that in his formula January was spelt with a small J as in january. The name for his cell was January. I wouldn't have been able to solve this problem as quickly if I had not had complete control of his worksheet and screen available locally. I'm not sure I would have been able to solve the problem had I not seen everything myself.

10:10am We switched back to voice and signed off.

11:15am Error on Page 15, telephone tutoring only.

1:30pm All tests completed, voice to data switched.
File transfer in progress.
Fast transfer. I said I would mark and return all files back in ten to fifteen minutes. Time 1:45pm.
I Was called to do some other work.

2:11pm I marked and returned the files by linking and voice to data switching with Roger.
Worked well. Recorded session.
Discussed the marking for his tests. He seems satisfied and is going to continue working on more challenging worksheets.

3:50pm Roger telephoned. He wanted information on detailed charts and descriptions and vertical writing capabilities in MsExcel. I was unable to satisfy all his information requests. I told him I would research the problem and let him know within a day or two.

June 20 New student.

8.30 am Cam called to verify operation of equipment
Used voice first. He hand dialled. We switched into data connection mode using Cosessions.
I said hi, we communicated at the MsDos level.
I then ran excel : CGA version... looks good.
Used Keyboard chat window... worked.
Exit from Excel, requested switch back to voice.
Cam accepted... looks good.
Spoke in voice.... equipment and procedures all operational.

8.40am Dave called back as instructed by Cam. Used voice first. He had hand dialled. Went over procedure for test completion, submission, marking and return. Reemphasized voice first always, requirement to contact me at the four times in the day, power initialization procedure for the modem and microcomputer....in case software hanged up.
Spoke about the tutorial lesson on Cosession™ scheduled for second day in the afternoon.

12.00pm Dave called me to say that tests A and B are complete. I told him that I would transfer them over to my machine for marking, using Cosession™. It looks like he's ready for cosession training right now.. ok.. lets see how the transfer goes...
Transfered from voice into data connection. ok.. he seems to understand all that is going on.
Went into DOS....oh! oh! problems... no reaction to keyboard ....I decided to go into keyboard chat,... using the F5 function key.... now everything is ok
We talked in keyboard chat mode....I now said let me go to Dos to show you more....he agreed..
Now everything is ok...even at the dos level...
Talked to Dave some more at the dos level... looks good...
Switched from dos to keyboard chat and back with Dave requesting the switch or myself.
Talked some more...
Asked Dave to switch back to voice.. he agreed..
Switched back... talked Dave through the proced.. ure to use F6 to hangup his machine, and F10 to exit his cosessions back to DOS.
We both decided that he didn't need to transfer his test over right away as he was feeling comfortable, with the exercises he was doing.

1.30pm Completed the training in cosession...

3.15pm I called Dave to say that I had other things to do He was ok.. He's on test E already... Wow! he is going fast.

He said he'd call in the morning at 8.45am.
We'll transfer his files then.

June 21

8.40am Dave called. I wasn't around..
9.00am I called Dave back. we discussed the software and the fact that there was no printer driver installed... He said he knew how to do that..he loaded it up, locally.
Dave is going to a meeting at 9:15am to 10:15am he'll carry on afterwards...ok by me..

11.45am Dave called. He wanted to see if we could use Date arithmetic to do calculations? I stated that what he wanted to do may not be necessary and that I could show him an easier more straight forward way. Demonstrated = cell address totals formula. Telephone call question and answer was used, no visual link required. Probably because he and I had the same workbook pictures.

1.35pm Dave called to say he'd completed all tests, worksheets and video tape lessons.
He requested we do some more training on Cosessions™. We linked using voice to data switch. I transfered all his files... no problems.
I then went into keyboard chat, showed him DOS level chat, ran his CGA version of excel, keyboard chat in excel, showed him how to save his messages and the other persons messages.
I then tried to switch back to keyboard chat...

1.55pm System hanged up...why???
It was repainting excel after keyboard chat in Cosession when it happened....waiting....
Dave had exited and had requested voice switch in Cosessions menu, I had done the same at the same time...
Waiting ..... I had told Dave that if the system looked like it was hung up to wait...
Eventually the system timed itself out, it switched to voice transfer... We both had our hand sets in our hands at our ears...
The line cleared up and we could talk...
We both signed off.

I went for a coffee break... I had told Dave I would mark his files and return them to him by day's end. He seemed unconcerned.

2.45 I started marking.

2.55 I had finished marking.
Requested a call back... His telephone is busy. I will leave my machine on call back..

3.15 I managed to connect, Dave was not around. I managed to link in unattended mode,transferred his files, left them on Dave subdirectory.
Signed off.

APPENDIX K

A set of student computer files

A typical set of computer files for one student

Volume in drive B label Thesis_Data

Directory of B:\Student7

.	<DIR>		07-06-90	9:12a
..	<DIR>		07-06-90	9:12a
PROFIT	XLS	3357	06-27-90	1:39a
EXA1	XLS	1213	06-27-90	10:09a
EXA2	XLS	1252	06-27-90	10:12a
EXA3	XLS	1387	06-27-90	10:14a
TESTA	XLS	1655	06-28-90	9:04a
EXERB1	XLS	1847	06-27-90	11:10a
EXERB2	XLS	2497	06-27-90	11:20a
EXERB3	XLS	2675	06-27-90	11:25a
TESTB	XLS	4067	06-28-90	9:06a
EXERC1	XLS	2340	06-27-90	12:04a
EXERC2	XLS	1660	06-27-90	12:11a
EXERC3	XLS	2113	06-27-90	12:25a
TESTC	XLS	2871	06-28-90	9:08a
PROFGRAF	XLC	1407	06-27-90	1:39p
EXERD1	XLS	2073	06-27-90	2:11p
EXERD3	XLS	2758	06-27-90	2:22p
EXERD2	XLS	2259	06-27-90	2:26p
TESTD	XLS	1974	06-28-90	9:10a
SORTMAC	XLM	1074	06-27-90	2:51p
EXER_E1	XLS	2830	06-27-90	3:25p
OILERS	XLS	2055	06-27-90	3:10p
FLAMES	XLS	2052	06-27-90	3:26p
TEST_E	XLS	2144	06-28-90	9:12a
ABC	XLS	2099	06-28-90	9:14a
ACME	XLS	2096	06-28-90	9:15a
TEST_F	XLS	1756	06-28-90	10:50a
EXER_F1	XLC	1618	06-28-90	9:33a
TEST_F1	XLC	1433	06-28-90	9:42a
TEST F2	XLC	1433	06-28-90	9:45a
KEN	LOG	126	06-27-90	3:39p
KEN	OOO	94354	06-27-90	4:14p
KENSCRNS	OOO	4002	06-27-90	3:40p

34 File(s) 796160 bytes free

APPENDIX L

Post Course Questionnaire

Self Learning supported by Computer Conferencing
Post Course Questionnaire

Information on this form is kept strictly confidential and is only available to the researcher.

Please answer the following questions by checking (✓) the appropriate space below.

SD = Strongly Disagree D = Disagree U = Undecided
A = Agree SA = Strongly Agree

	SD	D	U	A	SA
1. Video based training may be good for teaching some things but not MicroSoft Excel.					
2. I wish other courses could be taught using this methodology					
3. I like computer conferencing					
4. When I don't understand something, I can re-run that segment of the video tape, the teacher isn't always so compliant.					
5. When I run into a problem, I can always ask the teacher in the classroom, I can't do that with a person I can't see at the end of a telephone line.					
6. When you work on this system you never know where you are in comparison to the rest of the class.					
7. There were too many practice problems in the workbook.					
8. I feel more at ease in a regular classroom					
9. If a friend told me he was thinking about taking this course I would encourage him to take it.					
10. I would like to take the advanced course in Excel using a video tape and distance tutor approach.					
11. In the classroom, I work harder because of the competition					
12. When the teacher asks me a question in the classroom I get embarassed.					
13. I don't like using the computer to communicate with the teacher					
14. If I had to do this all over again I would rather take the course this way.					
15. I like to use the telephone line and computer conferencing.					
16. When I learn using the videotape, I don't feel like I'm competing with all the others in the class session.					
17. I miss the coffee breaks and complete day away from work that you get with a classroom course.					
18. I am unable to really learn in two hour gaps, I need the whole day to learn anything substantial.					
19. In a classroom you can always ask the person next to you if you get stuck or can't figure out a problem, you can't do that with computer conferencing.					
20. I am able to concentrate more when I am learning alone.					

APPENDIX M

Resume: Kewal Dhariwal

RESUME

Academic:

MEd. Adult and Higher Education
University of Alberta, Edmonton,
Alberta, Canada.

B. A. Business Studies and Management (Honours)
Middlesex Polytechnic,
London, England.

Certificate in Programming Languages
McGill University,
Montreal, Quebec, Canada.

Certificate in Data Processing
Northern Alberta Institute of Technology
Edmonton, Alberta, Canada.

Professional :

President (1989)
Data Processing Management Association (DPMA)
Edmonton Chapter.

Education Director, DPMA Canada ACFOR
Model Curriculum for Colleges and Schools.

Certified Data Processor (CDP)
Institute for Certification of Computer Professionals (ICCP)
Review Course Instructor
Faculty of Extension
University of Alberta,
Edmonton, Alberta, Canada.

Member : Canadian Information Processing Society (CIPS)
Edmonton Chapter.

Work History :

1988 - 1991
1985 - 1988

Program Head,
Coordinator
Microcomputer Institute
Division of Continuing Education
Northern Alberta Institute of Technology (NAIT)
Edmonton, Alberta, Canada.

Planning, design, development and delivery of programming related to the microcomputer industry across all technology areas from health to business to engineering to telecommunications. Management of over 200 courses, 150 instructors and 4500 student registrations.

1989-1990

Courseware Developer (on leave from NAIT)
Apple Innovations Support Centre

Division of Educational Research Services
Faculty of Education,
University of Alberta.
Edmonton, Alberta.

Reporting to the Executive Director of the Apple Education Foundation, duties encompassed a broad range of activities related to courseware development using Authorware Professional, MacroMind, Swivel 3D and a host of MacIntosh software tools.

1981- 1985 College Instructor
Computer Systems Technology
Business Department
Northern Alberta Institute of Technology
Edmonton, Alberta.

Teaching of programming languages, systems analysis , data modelling, accounting , statistics, operations research and management courses.

Extensive leadership in curriculum and technology change as well as in the setting up and delivery of multiple world class conferences.

1978 - 1981 Project coordinator, Project Leader,
Senior Systems Consultant,
Canada Post Office,
Major Area Postal Project,
St. Laurant, Montreal, Quebec, Canada.

Engineering systems design, installation, testing, management and implementation of two large projects involving process control, inventory warehousing and distribution equipment.

Successful delivery of two multiyear projects worth $4 million and $20 million.

1977 - 1978 Systems Auditor,
Trust Houses Fortes
1251 Bath Road,
Hayes, Middlesex, England, U.K.

Accounting systems analysis, planning, design and implementation.
Review of financial systems for adherence to company policies.
Development and programming of ICL mainframe applications.

1975-1977 Systems Analyst
Jardine D'Ambrumenil Ltd.
(International Insurance Brokers for Lloyds of London)
5658 Artillary Lane, London, England, U.K.

Organization and Management studies, system flow studies, data and document flow analysis.
Cost / benefit studies for mainframe solution(s) to automating the accounting and management information system.